

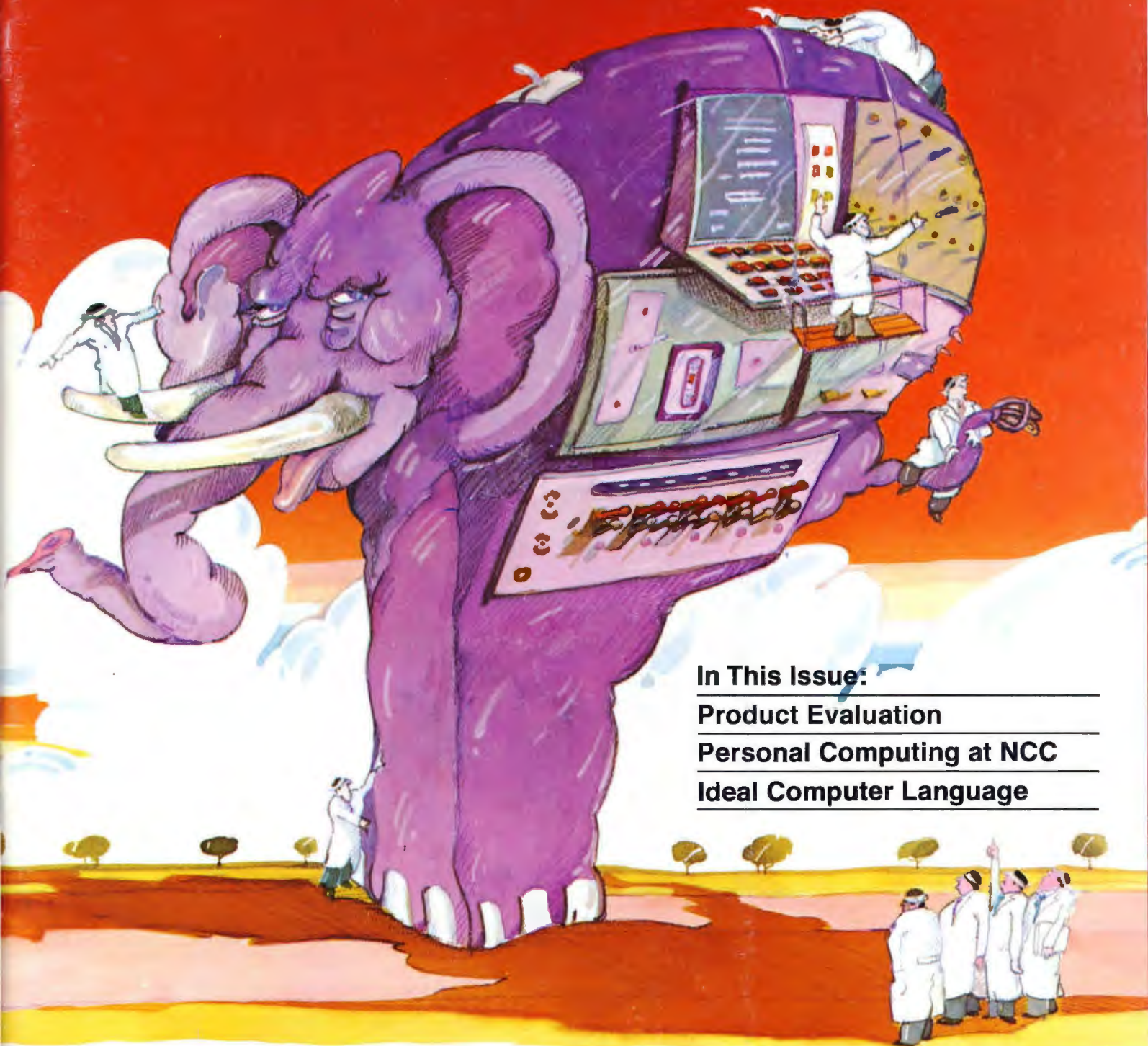
The Official Publication of the International Computer Society (SCCS)

Microcomputer

SCCS INTERFACETM

The Journal of Individual and Business Computing

Volume 2, Issue 1, August 1977 \$1.50 USA



In This Issue:

Product Evaluation

Personal Computing at NCC

Ideal Computer Language

W. Rogers

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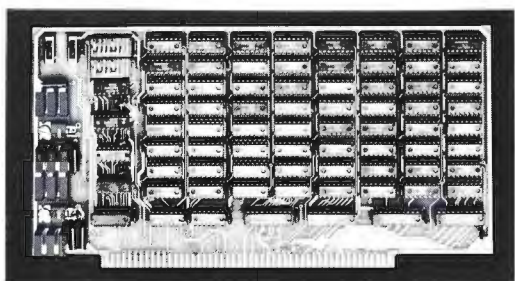
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EXCLUSIVE TO THE GAZETTE

It is now possible to purchase three 8K Econoram II™ boards for \$450. A single 8K board, the fastest selling computer kit in Godbout's history, is still available for \$163.84.

"We wanted to make it possible for the computer hobbyists to stuff a lot of memory into their machines at a reasonable price", Bill Godbout is quoted as saying today. Judging from the response, he seems to have succeeded.

However, a representative for the company stressed that price was not the only attractive feature of this board, citing the low current consumption (1.5A guaranteed, 1250 mA typical) and high speed (0 wait states). For users of Z-80 processors driven by a 4 Mhz clock, there is even on-board logic for implementing 1 wait state.

He added, "the vector interrupt feature, which lets you know if you are trying to write

into protected memory, is very handy. Also, the board was designed to be configured as two, separately addressable 4K blocks which adds considerably to the versatility."

A poll of users, undertaken by Godbout's, shows that hobbyists are pleased by the all-static design, which eliminates dynamic timing problems. Others find the tri-state outputs, and fully buffered inputs and outputs, to be their favorite features. All agree that the quality is exceptional, from the legendary and solder masked board to the low profile sockets.

Those wishing to take advantage of the special 3/\$450 offer should ask for #SPC-24. The standard 8K board (\$163.84) is stock number CK-008; an assembled version, #CK-010, is available for \$188.50. A 4K version of the board costs \$100 in kit form (#CK-007) and \$120 assembled (#CK-009).

PARTS FORECAST

A cooling trend is forecast, with the warm TTL front being weakened by cooler, lower power ICs such as CMOS and low power Schottky. As this colder front moves in, we can expect lower prices and decreased emphasis on husky power supplies.

CMOS

4000	\$0.25	4037	0.50
4001	0.29	4040	1.50
4002	0.34	4041	0.85
4007	0.29	4042	0.85
4008	1.28	4043	0.60
4009	0.53	4044	0.60
4010	0.53	4047	1.63
4011	0.29	4049	0.50
4012	0.29	4050	0.50
4013	0.50	4051	1.03
4014	1.23	4052	1.03
4015	0.90	4053	1.03
4016	0.45	4060	1.48
4017	1.23	4066	0.58
4019	0.55	4069B/	
4020	1.50	74C04	0.33
4021	1.23	4070	0.60
4022	1.20	4071	0.33
4023	0.29	4073	0.33
4024	1.03	4075	0.33
4025	0.29	4076B/	
4027	0.75	74C173	1.63
4028	1.00	4081	0.33
4029	1.73	4116	0.50
4030	0.50	14511	2.00
4033	1.50		

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74LS02	0.30	74LS157	0.95
74LS04	0.33	74LS160	1.40
74LS08	0.36	74LS161	1.40
74LS10	0.30	74LS162	1.40
74LS11	0.36	74LS163	1.40
74LS12	0.33	74LS168	1.87
74LS14	1.38	74LS169	1.87
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74LS26	0.43	74LS240	1.88
74LS27	0.36	74LS257	1.25
74LS30	0.30	74LS258	1.25
74LS32	0.38	74LS266	0.53
74LS37	0.45	74LS283	1.20
74LS38	0.45	74LS365/	
74LS42	0.98	80LS95	0.75
74LS47	1.00	74LS366/	
74LS48	0.98	80LS96	0.75
74LS74	0.50	74LS367/	
74LS75	0.68	80LS97	0.75
74LS76	0.50	74LS368/	
74LS86	0.50	80LS98	0.75
74LS109	0.50	74LS386	0.55
74LS125	0.63	81LS95	1.13
74LS126	0.63	81LS96	1.13
74LS132	1.25	81LS97	1.13
74LS138	1.10	81LS98	1.13
74LS139	1.15		

Energy Crisis Hits Home

Computer owners from coast to coast have complained of a lack of available energy for their computers. The problem lies not with power generating stations, but rather with the shortage of compact, low priced power supplies capable of providing the many voltages required by micro-processing systems. Experimenters also report being frustrated by the lack of power supplies.

However, the Gazette has confirmed existence of a solution to this energy crisis. Our highly placed source, nicknamed "deep volt", has leaked the following information about a "CPU Power Supply", also known by its stock number (#CK-014).

"The unit appears to be a well thought out supply, which delivers 5V @ 4A with crowbar over-voltage protection, along with ½ Amp of +12V and ½ Amp of -12V. A particularly sneaky feature is an adjustable 10 mA bias supply, required by some CPUs, that is often not included in other units. Those who say there are no economical power supplies for small systems are in for a shock as the price is a mere \$50.

"Despite rumors of a power supply energy crisis, with wildly inflated prices forced on a public with no other choice, it seems that the Godbout CPU Power Supply should lay these misconceptions to rest permanently."

MOTHERS SAFE FROM BUSS POLLUTION

Many motherboarders have reported flu-like symptoms (coughing, sneezing, dropping bits, scrambling data) when loaded with more than a few peripheral boards. It seemed that these motherboarders lacked antibodies capable of rejecting noise, crosstalk, overshoot, etc. This is commonly called "buss pollution".

However, it was discovered that a particular group of motherboarders, located in the wilds of the Oakland Airport, had developed an immunity to buss pollution.

It seemed these motherboarders had active termination circuitry, and that's what accounted for the difference. Old motherboarders may be immunized by simply plugging in an Active Terminator Network (#CK-017, \$29.50). Or, if you want a new motherboard, Godbout's has two --- both with active terminations, lots of bypass caps, and heavy PC board traces: #CK-015, a 10/11 Slot Motherboard, comes with 10 edge connectors and is excellent for adding on to small systems. \$90.00 #CK-016, an 18 Slot Motherboard, includes 18 edge connectors and is ideal for starting a stand-alone system. \$124.00

Processor Prices Plummet

The workhorse 8080A, darling of the chip set, has reached a new low in pricing. Prime, new full spec units cost only \$12.95 regardless of quantity purchased when you order part #SPC-22.

In a parallel development memory prices continue to drop. Full speed 2708s are now available for \$25.00; order part #SPC-23.

COMPUTER STRIKE AVERTED

Things looked tough at the negotiating tables located at computer stores throughout the country. The heart of the problem was a common computer grievance: having to shuttle programs in and out of their RAMs, thus hampering their productivity, and tying up work for hours at a time. Computers also complained of abuse at the hands of owners, who became enraged when programs went down the drain if the power went off for even a split second.

When the Godbout team of negotiators arrived on the scene, the computers showed a new spirit of compromise. After all, many of them had Godbout memories inside their cases --- and computers are known for their loyalty.

The solution: the computers would go on working, if the owners plugged Godbout Econoram II™ boards into their systems. Then, they wouldn't have to worry about losing their minds if the power went away, because Econorams hold programs and routines in erasable read only memory. So that owners wouldn't face undue hardship due to the extra expense Godbout's introduced several different boards, of various price levels and complexities. All of them feature 1K of static RAM as part of the memory; all of them are compatible with the S-100 buss used by Altair, IMSAI, and many others. They can be programmed by the Godbout Programming Service, or may be shipped unprogrammed.

Many computers, however, specifically suggested the 8080 software board. This 4K Econoram II is programmed with editor and assembler routines for the 8080, very much like the old Econoram; but this newer version has improved listings, which are a natural for getting any 8080 system up and running. For the benefit of any computers who did not receive word of the strike settlement, listed below are the boards offered by Godbout's:

#CK-002 (Smaller) Econoram II™: 2K X 8 of EROM.....\$195.00
#CK-003 (Basic) Econoram II™: 4K X 8.....\$250.00
#CK-004 (Bigger) Econoram II™: 8K X 8, configured as two separate 4K blocks.....\$350.00
#CK-005 8080 Software Board A valuable first step in breaking away from machine language programming.....\$265.00

TANTALUMS PICKED TO CLICK

Tantalum capacitors, long a favorite of industrial contractors where price is no object, are famous for their low series resistance. Now, Godbout's is making them available to the electronics hobbyist at popular prices. The list below shows all tantalum capacitors known to be in existence at the Godbout warehouse.

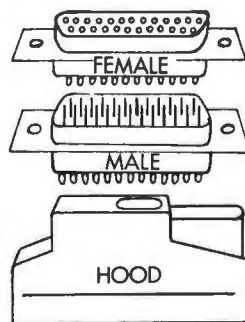
#CT0.47U	.47 uF	35V	4/\$1.00
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#CT2.7U	2.7 uF	20V	4/\$1.00
#CT3.3U	3.3 uF	15V	4/\$1.00
#CT4.7U	4.7 uF	10V	4/\$1.00
#CT22U	22 uF	10V	3/\$1.00
#CT33U	33 uF	10V	3/\$1.00
#CT39U	39 uF	10V	3/\$1.00
#CT47U	47 uF	6V	3/\$1.00

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Scientists discover missing link



Scientists have long puzzled over the "missing link" between computers and the outside world. Many have searched for this missing link, known in scientific circles as the DB-25 connector.

Extensive diggings at a certain manufacturer have resulted in the finding of this missing link by Godbout's trained researchers. They have isolated this missing link into three actual links, each of which performs a needed function in the crucial computer/outside world interface.

#CK-1004 - DB25P 25 pin RS - 232 connector, sub mini D type, male plug with plastic hood. \$3.95
#CK-1005 - DB25S 25 pin RS-232 connector, sub mini D type, female jack. \$3.95

#CK-1006 - DB25H plastic hood, which slips over the male plug to keep dust and glop from gumming up your connector. \$0.90

August 1977

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Microcomputer

SCCS INTERFACE

Volume 2, Issue 1, August 1977, \$1.50 USA

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President's Message



Largest Computer Conference in History

On June 13th-16th, the largest computer convention ever assembled took place in Dallas, Texas. At the invitation of Dr. Portia Isaacson, program chairman of the National Computer Conference, we conducted the day-long seminar entitled "How to Get Started in Personal Computing." My thanks to the many fine speakers who participated in this program. The overall attendance of 35,000 was more than 10K greater than the projected record attendance. The theme of the conference was "personal computing." It was gratifying to see our own field receiving such distinguished attention. Our thanks to the dynamic Dr. Isaacson and the AFIPS staff.

SCCS = ICS

In January, we polled our members regarding the name of our organization. We are following the majority's recommendation. Our descriptive name, the International Computer Society, is now an official name. This will help in presenting a more accurate picture of the Society's membership and activities. The Society's members reside in all of the states of the union, many other countries, and ships at sea (the U.S.S. Enterprise, of course!).

ICS/SCCS is the largest society in the microcomputer field. Our principal goal is the interfacing of members interests and needs with information and education about microcomputers. We are incorporating this in our masthead.

Tom Woodward, who has handled publication services for us in the past, is continuing as publisher, under license.

The Society has been moving steadily ahead in the pursuit of justice with regard to the legal actions underway. My thanks to the many of

you who have contributed to our legal defense fund.

Renew Now!!

Most memberships are now due. We would appreciate your prompt renewal. Renewal now for more than one year would be especially helpful. This will be beneficial to you, as well, in avoiding future increases and in taking advantage of the many Society discounts for meetings, publications, purchases, and activities (classes, symposiums, hardware clinics, etc.).

Exciting New Hardware

As you'll see from this issue, a major new line of microcomputers is being produced. Before the end of the year, many others will be offered. Activities in this field will continue to increase at an accelerated pace. This next quarter will represent a significant milestone in the art and science of small systems and personal computers.

Computer Clubs Unite

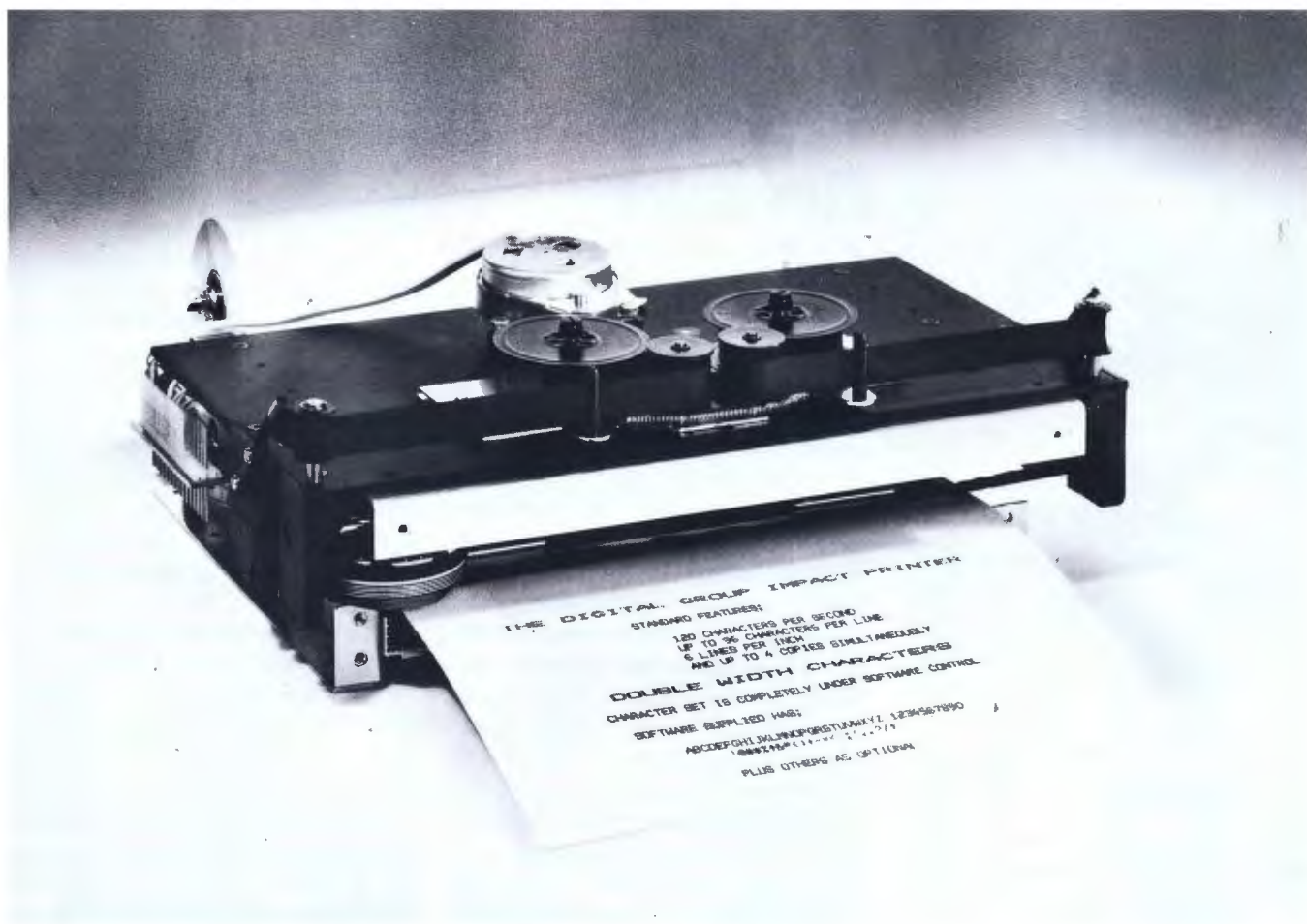
Two major meetings have recently been held to discuss the formation of a federation or Computer Club Coordination Council. I'd like to encourage efforts in that area and solicit your comments and suggestions. Information regarding this proposal will be supplied through *Interface*.

All club leaders should keep us informed of their mailing addresses and phone numbers.

Thank you for your interest and support.

Respectfully submitted,

Louis G. Fields
President



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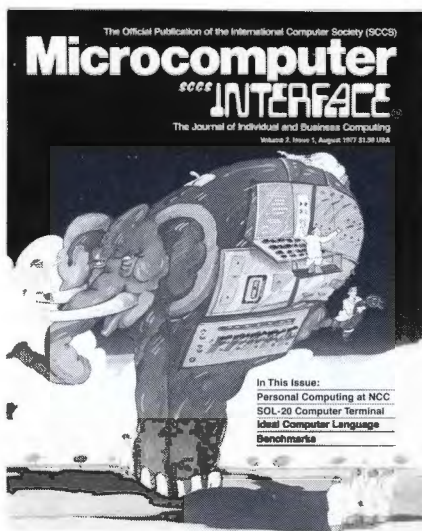
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Product Reviews

Cover Story

Equipment reviewers and computers, blind men and elephants—in both cases, men with necessarily limited backgrounds and world views must explore complex systems. In this issue, we begin to grapple with the problem of finding effective, economical strategies for product evaluation and review (see our editorial). We also present two examples, a review of the Sol and an article on decentralized benchmarking. The cover illustration is by Mike Rogers, who will be adding his visual wit to the magazine from time to time.



In this issue, I would like to begin experimenting with ideas for hardware and software evaluation and review. This is a subject of obvious relevance, yet it is difficult to deal with. Three possibilities for product review come to mind.

First, and most desirable, would be the establishment of a "Consumer Reports" sort of testing facility and staff. In such a lab, full time, professional technician/writers would perform comparative evaluations of products. For example, they would obtain a 16K memory board from every manufacturer in the field, devise a number of dimensions on which to test the boards, perform the tests and publish the results. Such a procedure would be impartial since all manufacturers would be invited to participate; it would be informative, allowing direct comparison of competing products; and it would be objective.

The problem is cost. ICS cannot afford such a lab and it is unlikely that we ever will be able to. Perhaps one of the commercial magazines could, but they might have problems of conflicts with advertisers. Another possibility for funding would be through a manufacturers or retailers association, but that seems unlikely.

The second approach which comes to mind is anecdotal reviews by individuals or groups who happen to have access to the product under review. Rudy Hirschman's article in this issue is an example of such a review. Anecdotal reviews appear in many magazines, and, like Rudy's, are often quite informative; however, there are problems with them. Rudy reviewed the Sol because Processor Technology Corporation was in a position to give us one for evaluation, but what of a small company which isn't? The process of selecting products for anecdotal review is at best arbitrary

and at worst nepotistic. Another problem with such reviews is that they typically describe only one item without comparison to others. Rudy did not have time to compare the Sol to the Apple, the Polymorphic, the Compal, etc. Another problem is that the author may be biased for or against the one product that he knows well. He may also be insensitive to the skill level of his readers. For instance the current issue of People's Computers has a letter from a woman who read a review of a machine and bought it without realizing that while it was accessible to the expert reviewer, it would not be easy for her to understand.

A third product review strategy is to try to decentralize testing. This would seem ideal from the standpoint of a club such as ICS where members can participate in the work. The basic idea is to publish a format for a comparative review, invite all readers to make tests of their particular piece of equipment within the context of that format and then publish the results of the tests. Perhaps in this manner we can achieve comparison of a wide range of products at reasonable cost.

The article on benchmarks in this issue is a first try at decentralized evaluation, and I invite you all to participate. If there is sufficient interest, we will try others. How about 16K memory boards? If we do 16K memory boards, what characteristics should we look at? What other items might we be able to handle in this manner?

Similarly, if you or a group would like to do an anecdotal review of a product, let me know what you would like to review, how you will evaluate it and what, if any, help you need from me.

Give some thought to the question of getting objective product reviews for all of us. Discuss it for half an hour at your next club meeting, and see if you can come up with an evaluation project along the lines I have outlined. Let me hear from you.

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137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170

READER SERVICE CARD

August 1977 Issue. Use before November 1977

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Fast Feedback on ICS

We would like to use the reader service card as a feedback channel. You may respond to the following poll by circling the appropriate numbers on the reader service card and returning it.

We also encourage you to submit questions to be used in these polls and to drop us a note if none of the replies reflects your opinion.

New Poll

Resolution to Amend the Bylaws

The SCCS Board of Directors has recommended an amendment to the Bylaws.

When the Society was formed, it was assumed that it would remain small and the Bylaws were written with that in mind. The Society has grown to a size at which some articles are not practical. The amendment recommended by the Board of Directors is designed to make Bylaw revision more easily accomplished.

3. Be it resolved that Article VIII, Section D shall be amended to read as follows:

Any amendment shall be valid to all intents and purposes, as part of these Bylaws, when ratified by a majority of the votes cast by regular members in an election for amendments, or by two thirds majority of the regular members present at a meeting called for that purpose, or by written pole. Written notice of such meeting shall be given to all regular members no less than fifteen days before the meeting.

129 For the Amendment

140 Against the Amendment

Reviews editor, Ron Carlson, has initiated a cumulative bibliography of books, articles, etc. in this issue. Give him feedback on his format and the usefulness of the idea.

- 130 The format should be different (send your suggestion).
- 131 The format is fine.
- 132 I like the idea well enough to scout out and submit items for inclusion.
- 133 I find the bibliography of interest and value, but don't really have the time to contribute.
- 134 I'm not even interested in the bibliography, stick to normal reviews.

In my editorial this month, I suggest the possibility of decentralizing product reviews by publishing a review format and soliciting data from the membership.

- 135 I don't think it's feasible, the products are too complex.
- 136 I wouldn't trust the results.
- 137 I like the idea and hope you do it, but don't have time to help.
- 138 I like the idea and will submit data on my system when you publish formats.
- 139 I like the idea so much that I (or my club) will devise a format for publication in a future issue.

Results From Last Poll

(Figures indicate percents voting)

We speak of SCCS helping people bridge the hardware/software gap. Do you consider yourself to be:

- 20 %
- 26 Primarily a hardware person.
- 37 Primarily a software person.
- 17 Already knowledgeable in both areas.
- 17 Really a beginner in both areas.

What is your highest educational level?

- 20 High School or less
- 46 Bachelors
- 22 Masters
- 12 PhD

Are you a professional in the field of computing?

- 52 Yes
- 48 No

Are you a professional in the field of electronics?

- 44 Yes
- 56 No

Do you use computers in your profession?

- 85 Yes
- 15 No

Are you interested in seeing hex dumps?

- 15 I never relate to anything at that low level.
- 55 Only print hex dumps if the reader

has the option of sending for an assembly language listing.
16 I would use a hex dump that size, but none longer.
14 Fun, not efficiency, is my goal as a hobbyist and I like to enter, decipher and work with hex listings.

The lowest level at which I feel programs should be published is:

- 35 Machine language.
- 49 Assembly language.
- 9 BASIC or other higher level language.
- 7 Language independent descriptions of algorithms.

We are experimenting with xerox reprints this issue

- 49 I like the idea well enough to try to help turn up good items to distribute.
- 45 I like the idea, but won't put any personal effort into it.
- 6 I don't even like the idea.

We had an article on the Altair Bus in the January issue, and are planning another. What sort of equipment do you have?

- 46 I already have an Altair bus based system.
- 22 I already have a non-Altair bus based system.
- 9 I plan to purchase an Altair bus based system.
- 6 I plan to purchase a non-Altair bus based system.
- 17 I'm not sure which way to go in my next purchase.

We've received a couple of complaints (a nice one from Carol and a grouchy one from Gene) about the December issue feeling too "commercial", because it featured stores and had a store owner's photo on the cover.

- 68 I disagree.
- 23 I didn't react at the time, but they are right.
- 9 Really, it bothered me also.

Should we bother with product announcements on new microprocessor chips such as TI's new 12L version of the 9900 or National's "number cruncher" with math instructions?

- 81 Yes, I'd be interested.
- 19 No, stick to more fully integrated products like kits using those microprocessors.

Last month we decided against publishing an article on a programmable calculator (the HP25), but maybe that was a mistake.

- 30 I am interested in articles on programmable calculators.
- 70 I am not interested in articles on programmable calculators.

Gene Murrow has proposed a member discount plan

- 18 I am not really interested in group discount purchases.
- 77 I like Gene's plan - do it!
- 5 I don't like it and am sending my criticism.

Fast Feedback Poll

Letters

Support

Gentlemen:

Please find enclosed my membership renewal form and one year annual dues check.

Also enclosed is a separate \$25 check for the Legal Defense Fund.

Sincerely,

Wallace D. Motley

Wallace,

Thank you very much.
Larry

Too Many Mailboxes

Dear Larry,

Please send the enclosed membership renewal and check to the society; there are too many addresses! The check includes \$10 for the legal fight.
Sincerely Yours,

David J. Tanner

Dear David,

Thanks much for your support. The correct, permanent address is 1415 2nd St., Santa Monica, Calif. 90401.
Larry

No COD Overseas

Larry,

How will members overseas be able to participate in the discount purchasing program?

James Staber

Dear James,

I don't know. Any suggestions folks?

Larry

PCC?

Dear Larry,

Here's a vote for group purchases! I don't yet have a system and I can't maintain a high level of craving one for many more months. I'm impressed by the Z-80 and, of course, Digital Group is nearby in Denver. Also, this is IBM country (near Boulder) and I'd love to find a good deal on a reconditioned Selectric.

"PCC" cropped up several places in the 1/77 issue. Before seeing it referring to Pertec, "PCC" meant People's Computer Company to me. You might want to head off any confusion.

Steve Johnston

Steve,

Thanks for the letter. Both Pertec and People's Computer Company call themselves "PCC", and I overlooked the possible confusion in my interview of the president of Pertec. All other "PCC" references are to good old People's Computer Company.
Larry

Info Needed on VDM/MITS BASIC Interface

Dear Larry,

I am enjoying SCCS Interface very much, keep up the good work!!

I have a problem which I hope you or some of the other members of SCCS will be able to help me with.

I have recently purchased MITS 4.0 versions of 8K and Extended BASIC. I also have Processor Technology's VDM-1. My problem is that my VDM-1 bombs out the 4.0 version of 8K BASIC, and will not even load with the 4.0 version of Extended BASIC.

I wrote to PT and they stated that they don't have any information on MITS 4.0 versions of 8K and Extended BASIC, and suggested that I contact (1) MITS, (2) local clubs, (3) local computer stores.

There are no local clubs in Alamogordo, so I am appealing to you.

If I should happen to get a solution from another source, I will pass it along to you.

Thank you very much,

Henry P. Amelung
1105 Juniper Drive
Alamogordo, NM 88310

Help Needed

Dear Sir,

I am a member of SCCS and I need your help. Can you recommend bibliographies on compiler construction and operating systems? I need books and other material at the college level, but not too difficult.
Yours sincerely,

A. Carlos de Sousa
R. Joao Pinto Ribeiro
No. 7-3 Exquerdo
Amadora, Portugal

Help

SCCS Interface,

I need help! I implemented Mike Thompson's modification to my TVT (Vol. 1, No. 1, Pg. 8) and it changed nothing at all. Have there been any corrections to it? I am using the Computer Controlled Cursor board. Does this affect it?

Please help.
Thanx,

John M. Billings
4101 Nellie Custis Ct.
Engleside, VA 22309



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Sotokanda

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Letters

Dear Gentlemen,

Would you send me post-haste all the latest information on computers for use in the home. A sample company magazine would do just fine or brochures, catalogs, price sheets, etc.; an urgent reply would be appreciated.

Thanks in advance for your kind cooperation.

Best regards.

Sincerely,

Carl A. Fawcett

Carl,

It wouldn't fit in a moving van! Join our society and get to know people in your area.

TV Sets for Graphics

Dear Sirs:

For some time now this laboratory has been experimenting at computer graphics within the faculty of architecture and urban planning.

During the last months we have been aware of change in patterns within the computer world: the surge of microprocessors and of amateur computer groups.

We are much interested in gaining a perspective of progress in the area especially in its graphic applications.

As such we would be thankful if we could obtain information from you regarding: actual activities of your group and about experiences you may have had utilizing T.V. sets as graphic terminals.

In turn, we are including general references to our own work.

At the moment we are utilizing conventional equipment (Wang 2200, screen, printer, plotter, 20K) but would be interested to begin assembling our own computer.

Any suggestions will be deeply appreciated.

Sincerely yours,

Prof. Gonzalo Valez Jahn
Coordinator
Laboratory of Advanced
Techniques in Design

Universidad Central De Venezuela
Facultad de Arquitectura y Urbanismo
Laboratorio de Tecnicas Avanzadas
En Diseno, Piso 9
Caracas, Venezuela

Dazzled

Larry,

I have been sitting here dazzled by the MANDALA program (February *Interface*) for 30 minutes. Fantastico!

Dwight Egbert

Please Help!

Dear Sir:

I am a member of the SCCS and have a SPHERE 330 system. Recently I bought a MP-40 Printer from MPI and still am unable to operate it. I understand that there is a Sphere User Group within the SCCS and would appreciate it if you can direct my letter to them.

Since SPHERE is out of business, I can only turn to the fellow users for help. At this moment, I have the following problems.

1. I need software to run the MP-40 Printer from MPI. My Sphere has the V3N Proms. I have a copy of software from Adams Scott, but I am still unable to use it.
2. There is a capacitor next to the PIA port B socket on the SPHERE CPU/2 board. Do I have to remove that when I connect the printer cable to this socket?
3. After I hit reset on the Sphere system, and go to the Debug mode and try to open an address location, I am not able to get the usual 0033 42, instead I get OOMM MM. Can you suggest what is wrong? I can only go back to the usual mode and open a location by hitting "CTL S" then "CTL 0".
4. Can anyone suggest an assembled Floppy disk system to be connected to my system? I am not a hardware man, as you can see that I am still having trouble with the printer routine.

Thank you and look forward to hear from you soon.

Sincerely yours,

Mr. E. Cheng
Box 6177, TST
Kowloon, Hong Kong

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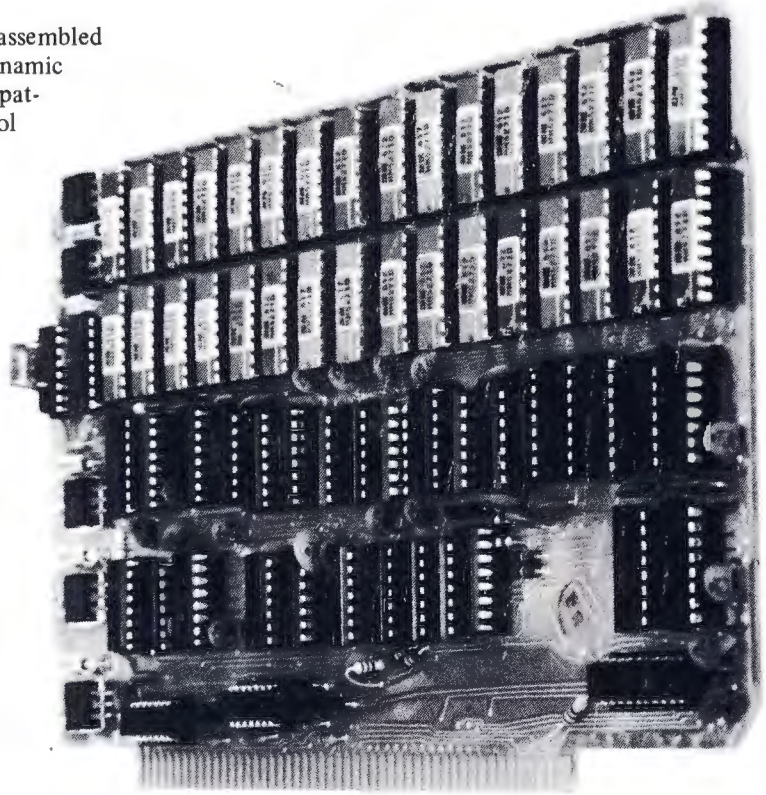
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Society News

Multi-Media tutorials Available

The Society is producing the first of a series of Multi-Media Tutorials on new developments and fundamental techniques in the microcomputer field. The first two half hour presentations, by Mike Shrayner, interviewed by Lou Fields, are "The Electric Pencil, Text Editor" and "ESP.1 Assembler Monitor and Editor, a Cassette Operating System." The audio cassettes and slide carousels will be available September 1, free to Society Chapters, and at a rental cost of \$15 prepaid to groups and schools. If interested, contact Tom Woodward, Microcomputing Interface, 1415 Second St., Santa Monica, California, 90401. (213) 451-8774.

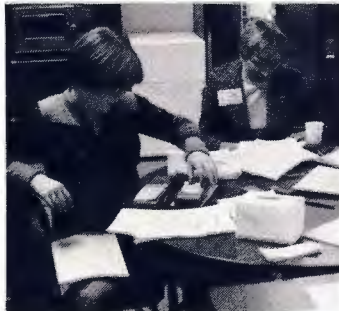
Help

Interface needs help. Would you like to be responsible for a department? Reprints? New Products? Fast Feedback? Etc.? If interested, contact Lou Fields, P.O. Box 49707, Los Angeles, CA 90049.

ICS/SCCS election of officers

Ballot information will appear in the September issue

Meeting of the
Minneapolis Chapter . . .
lot's happening.



Photos by George Nelms

Clubs and Chapters

Pomona, California

The Pomona Valley Chapter of the SCCS held its first meeting May 19, and discussed ideas for future programs and club activities. A survey of the members showed high interest in programming methods and techniques, programming languages, computer applications, and hardware design and construction. Machines owned or used by those present include four 8080's (Altair or Gnat), four 6502's (Apple or Kim), a 2650 (Processor Applications), and a couple of PDP-8's.

The programs for July and August meetings (first Thursday of each month) were discussed, and will include hardware demonstrations and talks on microprocessor fundamentals and assembly language programming.

Meetings are held from 7 to 9 PM at the Pomona Public Library, 625 S. Garey Ave., Pomona, CA.

For additional information contact: Al Sutton, 4155 Oak Hollow Rd., Claremont, CA 91711 (714) 593-6635 evenings.

Texas

The Permian Basin Computer Group in the Midland and Odessa area of Texas has meetings once a month. The Midland Group meets the second Monday each month at 7:30 p.m. in the Student Center on the Midland College campus. The Odessa Group meets the second Saturday each month at 1:00 p.m. in the Electronics Technology Building, Room 203, on the Odessa College campus. For additional information write John Rabenaldt, Box 3912, Odessa, TX 79760 or phone (915) 332-9151 9:00 a.m. to 5:00 p.m. Monday through Friday or (915) 697-4607 after 6:00 p.m.

Reprints

To request a reprint send a self-addressed, stamped envelope plus a copying fee of 10¢ per page (send stamps, coins, whatever). If an author wants a "royalty", he should let us know and we'll add that to the cost of the reprint for him.

Print Using

A short tutorial on the PRINT USING statement in BASIC. A number of examples are included. The article is by Gene Dial and it appeared in *Interrupt* from the Denver Amateur Computer Society. SASE + 20¢.

8080 OS

Paper design for EMOS-8, an Extensible Microcomputer Operating System for the 8080. Memory use, multitasking and interrupts, entity

naming, I/O, VDM, editing, loading, assembling, debugging and standardization are covered. Bob Wallace, the author, invites feedback and the design is in the public domain. Implementation is beginning. SASE + 70¢

Pennywhistle Evaluation

A brief review of the Pennywhistle Modem, by William E. Fisher, Jr., which appeared in the Pittsburgh area Computer Club Newsletter. William likes the Pennywhistle and M & R Enterprises from whom he purchased it. SASE + 10¢

8080 Language

Specifications of EMUL-8, an Extensible Microcomputer Users Language for the 8080. This was also written by Bob Wallace of the Northeast Computer Club. SASE + 40¢

Cybercom VB1 Fix

A fix for unstable vertical output on the Cybercom VB1. By John Schulein in the Homebrew Computer Club Newsletter.

Recorder Mods

Modifications for the J. C. Penney

Co. 6536 and 6551 Tape Recorders which are recommended by Tarbell. Keep the speaker on and the mike off. By Lorin Mohler, North Orange County Computer Club. SASE + 30¢

IMSAI Fixes

Half a dozen quick, miscellaneous fixes for IMSAI's by Leon Rue of the North Orange County Computer Club. SASE + 10¢

Lunar Lander

A lunar lander in Tom Pittman's Tiny BASIC, written by David G. Krauss in the Homebrew Computer Club Newsletter. SASE + 20¢

Phone Detector

Mike Firth showed a simple circuit to detect the ringing of a telephone in the June issue of the Newsletter of the Computer Hobbyist Group of North Texas. SASE + 10¢

Proposed S-100 Bus Standards

Joe Killian of IMSAI presents a proposed standard set of equations for use in decoding S-100 bus operations. SASE + 20¢

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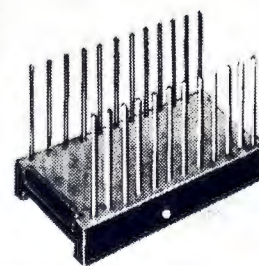


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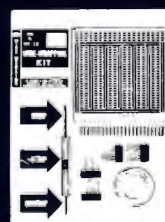


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Personal Computing at NCC

By Ken Widelitz

Ken Widelitz is an attorney and member of the ICS Board of Directors. Ken attended his first NCC for a number of reasons: curiosity, to propose the formation of a computer retailers' association, to give a talk on tax aspects of personal computing and to report on what transpired for our readers.

This article shows and tells what he saw.

Personal computing had its debut with the big boys at the 1977 National Computer Conference in Dallas, Texas, in June. Almost every participant on the personal computing panels had something to say about the significance and impact of the event. Comments ran the gamut from "Personal computing has come of age" to "We shouldn't be here." Being a rookie in the NCC world

myself, I really couldn't say. It did seem natural enough for personal computing to be at the NCC.

Dr. Portia Isaacson, the '77 NCC Conference Chairperson and owner of a computer store in Texas, was the person most responsible for bringing personal computing to the NCC.

Computer Club Congress

Some twenty-five or thirty computer club leaders accomplished a great deal in two sessions chaired by Rich Kuzmack of the Chesapeake Microcomputer Club. The stated purpose of the Club Congress was to form a national association or federation of computer clubs. It was readily apparent that the representatives had given the subject matter a good deal of thought and most of the first session was spent in airing those thoughts.

The major area of concern was the actual form and makeup of the national group. The discussions centered around whether it would be best to have a national club of computer club leaders, a national association of clubs themselves or a national organization to which individuals would belong. The general reaction was that the group should be made up of clubs rather than

individual club leaders or members. It was pointed out that such a format might create problems for computer clubs affiliated with schools and the armed services because such clubs are often not allowed to be a member of a non-affiliated organization or to give any of their income to such organizations. That point opened up the question of financial matters. A few representatives indicated that their members had given them the authority to commit club funds to the formation of a national association. Others stated that such a matter would have to be brought up to members at the next meeting. In order to minimize travel and telephone expenses, it was suggested that the national group have as its members regional groups which would be formed by clubs in geographically smaller areas.

Of course, another important topic of discussion was the purpose of the national group and the activities it would undertake. It was suggested that one purpose would be to provide course outlines and study materials for club sponsored hardware and software tutorials. Other suggestions included putting together a "tool kit" to help new clubs get started, serving as a clearing house to direct potential members to com-

Personal Computing Sessions

A recurrent theme in many of the personal computing sessions was the effect of the emergence of a retail market on personal computing. The first day of the NCC saw a meeting of computer store owners with the purpose of forming a national association of their own. Unfortunately, the store owners were not as successful as the club leaders.

However, store owners and potential store owners were presented with a wealth of computer retailing information. A session entitled "How to Start and Operate a Computer Store" chaired by Paul Conover, was well attended. The focus there was on profitability and margins. David Bunnell gave some helpful hints on advertising and promotion. Other sessions concerning retailers were "Products of the Retail Market", chaired by Adam Osborne and "The Future of Retail Computer Stores". The latter session included Paul Terrell (Byte, Inc), Ed Faber (Computerland), and Dick Heiser (The Computer Store). While there was much concern with the entrance of the large manufacturers and retailing chains into the personal computing marketplace, the general consensus of the panel was that computer specialty stores would flourish, riding the crest of the wave rather than being drowned by it. Most of the excitement in that regard was generated by Commodore's Pet and its \$595 price tag. Dick Heiser was very excited by the unit and praised it to the hilt. Paul Terrell also thought that the unit would be good for the computer retail market on the whole as the anticipated national advising for the Pet would make the general public aware of the availability of personal computers. It was Terrell's view that the specialty computer stores would survive in the same way that specialty stereo stores have survived, even though large chains and department stores all now sell stereo equipment.

ICS Session

We organized a full day session

Speakers at the ICS/SCCS personal computing sessions at NCC.



Lou Fields ICS/SCCS President, Chairman.



Bill Grinker



Lee Felsenstein



Ken Widelitz



David Bunnell



Dick Heiser



Bob Marsh

puter clubs in their area, a software exchange and a newsletter. The newsletter would let clubs see what kind of programs are being put on in other areas of the country, give suggestions for recruiting new members and for fund-raising activities, etc.

The first session concluded after representatives of the Chesapeake Microcomputer Club, the Midwest Affiliation of Computer Clubs and the International Computer Society described the structure and inner workings of their organizations.

A second session on the next day opened with the announcement that representatives of computer clubs in Louisiana, Texas, Oklahoma, Arizona and New Mexico had formed the South West Federation of Computer Clubs. Many of the problems raised at the prior day's session were rehashed. Jim Warren volunteered Dr. Dobb's Journal and *Interface* offered to serve as a vehicle for information exchange on the national organization. The second session wound up with approximately a dozen representatives volunteering to serve on a committee formed to draft the articles of association and by-laws of a national association of computer clubs.

entitled "How to Get Started in Personal Computing" as a part of the NCC. Speakers were Lou Fields, ICS president, Bill Grinker of the Computer Warehouse Store, David Bunnell of *Personal Computing*, Ken Widelitz, attorney, Bob Marsh of Processor Technology, Lee Felsenstein, designer, and Dick Heiser of The Computer Store. Some of the points we heard during the talks and discussions were:

- The hobbyist market is not as large as it is rumored to be, perhaps 155,000 systems by the early 1980's.
- Maintainability, not software, is the key problem in business systems . . . any businessman who puts in a kit for running his business is a turkey.
- You can qualify for a 10% investment tax credit on your system, as well as depreciation and other expenses if you can convince the IRS that you're in it for profit.
- Bus standards are irrelevant, standards for tape format and high level languages are the key to program exchange.
- The personal computing market is only about \$30 million—DEC expense accounts probably exceed that.
- Stores which don't talk down to naive customers will make it.
- Don Lancaster didn't have a computer terminal in mind with his original *Popular Electronics* article on the TVT-1.
- Ten thousand people sent in \$2 for TVT-1 plans in 1973, and they typically got 100 requests for plan sets.
- The Commodore Pet is still scheduled for this fall, but the anticipated price for the system is up to \$600, not \$500.

Calendar

We go bananas each month putting together the Calendar section because we can't get current information on clubs, so we are going to try something new. We will publish the usual entries for large meetings and events and merely list contact numbers for local clubs. This time we will list the clubs from the last calendar. Let us know if you would like to add your club to the list. If you would like us to publish regular meeting announcements we will, but you must get them to us two months in advance.

(213) 849-7111 San Fernando Valley

(213) 849-7111 San Fernando Valley Chapter

(213) 822-8567 Santa Monica, Bay Chapter

(213) 681-7047 Pasadena Chapter

**(213) 377-4811 South Bay Chapter
Ext. 545**

(213) 598-0444 SWTPCO Users Group

**(213) 681-7047 LSI-11 Users Group
(305) 452-2159 Space Coast Micro-computer Club**

(612) 941-1051 Minnesota Computer Society

**(703) 356-8918 AMRAD, Vienna, VA
(714) 998-5831 North Orange County Computer Club**

(716) 889-2971 Rochester Area Micro-computer Society

(801) 467-9100 Utah Computer Association

(805) 985-2631 Ventura County Computer Society

(805) 962-7734 Santa Barbara Computer Association

(915) 697-4607 Pecos Basin Computer Group

August 20

ICS/SCCS General Meeting, TRW, Building S Cafeteria, Redondo Beach, CA, 10 a.m. to 5 p.m.

September 17, October 22, November 19, December 10

ICS/SCCS LA area meeting. Call (213) 644-4658 or (714) 645-7841 for information.

August 15, 1977

Compcon 78. Call for Papers. Submit a 1000 word digest to Dr. Dean Brown, ZILOG, 10460 Bubb Road, Cupertino, CA 95014. Home, school and hobby computing are of interest.

September 17

A meeting has been called for 2 p.m., September 17. This will be held at the Shamrock Hilton in Houston in conjunction with a local computer fair. At that time representatives of other clubs in the region will be invited to participate in definition of the Southwest Federation of Computer Clubs structure and goals.

October 21 Deadline for NCC '78 Submissions

You are invited to participate in the 1978 National Computer Conference.

HOW TO PARTICIPATE IN NCC '78

1. Write a paper for review.
2. Prepare a demonstration of a new or valuable application.
3. Prepare a short talk for an open information exchange.
4. Send us your ideas on topics you would like to hear about at NCC '78.

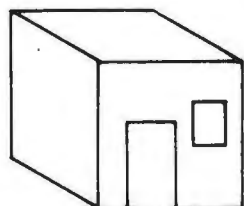
Deadline for all submissions is October 21, 1977. Authors will be notified as soon as possible and no later than March 1, 1978 regarding acceptance. Please send your submissions to:

Mr. Stephen W. Miller
CONFERENCE CHAIRMAN
Stanford Research Institute
333 Ravenswood Ave., L 1109
Menlo Park, CA 94025

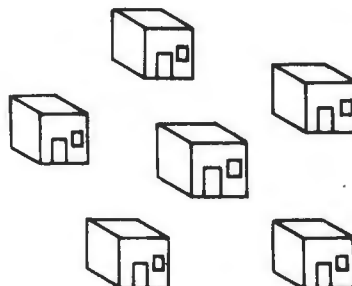
or

Dr. Leonard Y. Liu
PROGRAM CHAIRMAN
IBM Research Laboratory
K51/282
5600 Cottle Road
San Jose, CA 95193

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The Sol-20 Computer Terminal

By Rudolf Hirschmann

Rudy Hirschmann has written a review of the Sol computer. Rudy is a professor of German at the University of Southern California, where he is using microcomputer based systems for type-setting and for teaching.

The Sol-20 terminal computer from Processor Technology certainly makes a good first impression. It has the general appearance, shape and size of an electric typewriter with a full keyboard, attractive blue metal case and genuine walnut end plates. These would make it seem more at home in a modern office somewhere downtown rather than in my less elegant computer shack at home.

But beneath that sleek exterior lurks a genuine microcomputer that is capable of doing most everything that a state-of-the-art microcomputer ought to do. A fully operational Sol-20 consists of five circuit boards, namely the main circuit board, the plug-in personality board, the keyboard, the bus extender board and the power supply. I will discuss each of these in turn.

The main circuit board is by far the largest and most complex of the subassemblies for this computer. It combines the functions of several conventional S-100 plug-in boards, namely that of an 8080-based CPU board and a video display generator for sixteen lines of 64 characters each. In addition, it also provides a very useful combination of functions that are normally available only on several additional boards, namely one serial and one parallel I/O port, a reliable cassette I/O port that uses the "Kansas City/Byte" standard at

either 30 or 120 characters per second, a modest amount of RAM and address decoding as well as a connector for up to 2K bytes of ROM. This ROM is actually held on a small board that plugs into the main board. A power-on-jump is also provided to this ROM, and for that reason this board is known as the personality module. More on that below.

The layout of the main board seems to be straightforward, logical and well executed. All features of this board worked as they are supposed to, although three errors in trace routing had to be corrected. This problem should be solved in boards marked Rev. E and beyond. The physical quality of this and the other boards is first rate. All traces and plated-through holes conducted properly, and a solder mask and parts labeling are provided.

Four sets of DIP switches are included on this board to allow easy selection of certain options. One switch allows changing the characteristics of the video display (which is virtually identical to Processor Technology's VDM-1), another selects the baud rate, while the third changes the word format for the serial I/O port. The final DIP switch is a thoughtful concession to those of us who have grown accustomed to a front panel, namely a set of eight sense switches connected as input port 255. While the location of these switches is a bit awkward (the cover has to be removed to get at them), it is nevertheless possible to run programs that depend upon the use of the front panel sense switches of an Altair or IMSAI system. It should be noted that the single step and the memory protect/unprotect functions are not provided for. This means that your memory boards must always go to the unprotect mode when power is turned on and then stay there. An easy modification circuit for this purpose appeared in *SCCS Interface* vol. 1, no. 4 (March, 1976), page 43, that will take care of any problems in this regard.

In order for you to assess other potential hardware/software incompatibilities with your present system, let me give you the port and memory locations implemented on the main board. Port F8 functions as a control and status port for serial I/O, F9 is the serial data channel, FA is the control and status port for parallel, cassette and keyboard I/O, FB is the cassette data port, FC is keyboard data, FD is parallel data, FE is status and control for the video display and FF is sense switch input. So far as memory allocation is concerned, personality ROM is from C000 to CFFF, system RAM is C800 to CBFF, and video display RAM is CC00 to CFFF.

Turning now to the personality plug-in module, this is available in several different implementations. As a CONSOL module it consists of a small plug-in board with two 5204 PROMs and space remaining for two more. In other words, 1K of firmware is implemented and space for an equal amount is left empty. As a SOLOS module, this same board is supplied with four 5204s. Presumably the SOLED will be supplied in the same form when it becomes available. Plug-in modules using other PROMs, such as the 2708, are also supposed to be in the works. That way all of us Bytesaver owners can implement our own firmware.

I had a chance to work with one CONSOL and two different SOLOS modules. Each of them has drivers for all I/O ports and the video display system as well as some very useful file handling firmware for the cassette I/O channel. When you record a section of memory onto tape, you must specify a starting address, a length and a name; you also have the option of specifying an execution address. All of this information is automatically stored as a header on the tape before the specified block of memory is stored. The beauty of this system becomes apparent when retrieving stuff from tape, because, although you could specify everything manually, you can

also simply specify the name mentioned above, and the firmware will then ignore all data on the tape until it encounters the same name in a header. It then transfers the block to the address that is also specified in the header. This may not be as convenient as a floppy disk, but it is a big step upward from systems that have no firmware support.

The keyboard is custom designed for the Sol terminal and is made up of high quality parts throughout. The keys feel solid and durable, and a good selection of special-function keys is included. The keys of the numeric pad (not included in all models of the SOL) are not simply connected in parallel with the corresponding keys on the main section of the keyboard. Instead, they are encoded separately, and the output code of the numeric pad has the eighth bit turned on, even though this bit is not used in the ASCII standard. It is easy enough to ignore this bit for most applications, but in special situations, that extra bit can be used to implement special control functions via the numeric pad. An application I am presently working on will have these keys control a set of cursors in a fairly complicated text editor.

A little quirk of this keyboard is that the key used for the backspace function does not generate the standard ASCII backspace code. This may not become a problem until you try to interface existing software with this system, but even then the solution will be straightforward. The time I found this anomaly disturbing was when I used the Sol as a remote terminal connected to a large computer over the telephone lines. In this situation it is necessary to transmit a control-H in order to have the large computer understand. This, however, shows up as a displayed character on the screen instead of an actual backspace. Moreover, the character that is used as a backspace in the terminal is blocked in firmware from being transmitted. In short, there is no way of implementing a

satisfactory backspace in this situation. In addition, the firmware allows most (but not all) control characters coming from the large computer to be displayed on the screen. For those who will use the Sol as a remote terminal, these may be regarded as annoying factors; but they can surely be solved in firmware. Processor Technology, are you listening?

So far I have been talking about the basic components that make up many good terminal computers. What makes the Sol particularly noteworthy, however, is the inclusion of a bus extender board that adopts the essential conventions of the S-100 bus. That means that virtually all plug-in modules available for the IMSAI and Altair 8800 computers can be used in the Sol, and this shows the great advantage to the hobbyist (and manufacturer) for adopting some sensible standards. Are the other manufacturers listening?

The bus extender board plugs vertically into the main circuit board, it has plug-in positions with card guides for five horizontally oriented boards and an additional test position on top. This board has good large traces for power distribution and is double sided with plated through holes. Why all that trouble on a simple board like this? It allows for shielding, because little fingers of grounded conductors are placed between all the other bus conductors. I couldn't test them for their actual effect, and one might question their necessity on such a small backplane. But this type of design is also being adopted by others, and it is certainly indicative of fine engineering practice and is a step in the right direction.

I have saved the power supply for the end, because this is where a tendency that was evident throughout the entire machine was evident most clearly, namely the tendency to overdesign. This power supply is gutsy and will never have to be upgraded unless you somehow double or triple the size of that bus extender card.

There are two separate +8 V

supplies, one supplying power only to the main mother board, and the other only to the bus extender board. The first of these is filtered by 18,000 ufd., regulated with discrete parts and protected by a crowbar circuit! It is normally called upon to supply about 1.5 A, but I loaded it down to twice this value, and everything looked fine even after an hour. The other +8 V supply is filtered by a capacitor of 54,000 ufd., and according to my measurements it can safely supply more than 10 A and still not run very hot. That translates to over 2 A per bus-extender slot, and that is certainly adequate. The + and - 16 V lines are hefty enough to handle any reasonable load.

All of these components are put together in an attractive case. The metal is fairly heavy gauge steel throughout, and everything has a very solid feel to it. The only thing I can quibble with is that in order to get at certain components, many others must first be removed. Some additional thought on this score, such as splitting the subassembly that holds the card guides in two, would make disassembly easier.

My overall impression is that the Sol-20 is a well designed machine and that many potential problems have been solved before releasing the product, a practice that should be more widely observed. As it stands, this machine still has a few problems as mentioned above, but they seem to be small ones that can either be solved in firmware or in slight adjustments in packaging.

There are a few other machines that have characteristics similar to those of the Sol-20, but none of the other single-package terminal computers presently on the market uses the 8080 and the S-100 bus. These factors alone should make the Sol-20 an attractive machine for many. The fact that the cost is relatively modest (\$475 for the main circuit board only in kit form, \$995 for the whole machine as a kit and \$1395 assembled with the CONSOL module) should serve to add to its popularity.

Applications Exchange

By Larry Press

The Applications Exchange is intended to serve as a switch board, putting members with specialized information and interests in touch with each other.

A coordinator may be passive, merely maintaining a mailing list and putting people in touch with each other, or more active; for instance, organizing a periodic SASE Newsletter, writing for Interface, or soliciting interesting contributions to Interface. The basic philosophy is decentralization, so each coordinator sets his or her own style.

Wouldn't you like to be a happy go lucky coordinator?

Poly Morphic 88 Hardware and Software

Roger Lewis will coordinate information on the Poly Morphic 88 hardware and software. His background includes 10 years in electronics and 11 as a programmer, so he is certainly well qualified. He is anxious to provide a central clearing point on this processor and would edit a newsletter or column, if members are sufficiently interested. He has a particular interest in programs for small business but is anxious to hear of and report any unusual applications of the Poly-88.

Civil / Structural Engineering Applications

Dave Lavers has volunteered to act as our coordinator for applications in the field of Civil/Structural Engineering. Dave is a structural Technologist with a consulting engineering firm in Calgary, Canada. His main interests are microcomputer applications in the analysis and design of building structures but he would like to facilitate the interchange of ideas and information in all related areas. His specific interests include the development of new software and the conversion of existing software to make the microcomputer an easily accessible, inexpensive and valuable tool for the Engineer.

Some of our new coordinators are introduced below. We'll introduce the

rest when space permits.

Robotics

Glen Norris is president of the United States Robotics Society (USRS) and is our new coordinator for robotics. He introduces himself as follows: I am vice-president of a small research foundation, managing contract research projects in a number of technical areas, of which one is artificial intelligence, chiefly self-organizing systems and pattern recognition. My BS in Electrical Engineering is now so ancient, and my work has been so varied, that I suppose I am now a general technical manager, rather than a specialist. As we proceed with USRS, I find myself becoming more of a robotics expert than I ever expected to be.

Games

G.C. Covington III will take over from George Tate as games coordinator. Gary became interested in micro-computers through his job as Senior Project Engineer for the Space Shuttle Avionics and Software. In April of 1976, Gary purchased an Imsai kit and a T.V. character generator. The easiest way for Gary and his sons to keep things interesting while they learned BASIC was to use games. Today Gary and his three sons, Gary IV, John and Rob have over 200 games and some interesting ideas about the structure of games, what kind of games are most apt to hold your interest, etc. He will be sharing some of these thoughts with our readers in coming issues.

Gary is a charter member and on the board of the North Orange County Computer Club.

Legal Implications of Personal Computing

Mike Scott has volunteered to coordinate information regarding legal matters. He is now an attorney but has five years professional background in computing and has written a book on computer law. Mike wrote the following to introduce himself:

I perceive many legal implications of personal computing which, until

now, have not been explored at all and which could conceivably cause difficulties in the longrun as personal computing becomes a significant sub-industry within the computer field. Such areas as protection for software, copyright and patent infringement by hobbyists, privacy, computer crimes, etc., all readily come to mind. Although they exist in the larger computer industry as well, it would appear that they would have special significance in the personal computing field.

VTL/2

Frank McCoy has volunteered to be our VTL/2 coordinator. VTL/2 is a super-concise, higher level language (see the January and February issue of Interface). Frank has been into electronics since he was 9 years old and is an expert on the 8080 and 6800. Along with Gary Shannon he designed VTL/2 for the MITS 680 and he implemented the 8080 version himself.

Humane and Community Oriented Applications

Andrew Clement will coordinate for applications in the area of humane and community oriented computing. Andrew has a grant to compile a survey of humane applications of computers. He is currently on a tour, visiting a number of public access and community information system projects. If you share his interest or know of projects he might want to contact, let him know. He is also in touch with humanistically oriented computing projects around the country and may be able to tell you of one in your area.

Computer Chess

Doug Penrod is our coordinator for computer chess. He and his friends Russ McNiel, Kevin McLoughlin and John Ford tried to get someone to start a computer chess newsletter, and having failed, have started their own. Doug got a ham ticket in 1937, bought his first computer book in 1950, attended the SCCS foundation meeting at Don Tarbell's house, has worked on founding three local clubs and has an LSI-II, an Altair, and a SC/MP (some of which work). Send him contributions for his newsletter!

Applications Exchange Coordinators

Civil and Structural Engineering

Dave Lavers
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Programs for small children:

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Menlo Park, CA 94025

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(616) 897-5822

Amateur Radio Applications

AMRAD,
1524 Springvale Ave.,
McLean, NJ 22101

Mark-8 hardware, corrections, add-ons, and software:

Ronald Carlson,
14014 Panay, #255,
Marina del Rey, CA 90291

Voice synthesis:

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(213) 392-5230

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Placentia, CA 92670
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Electronic music:

Prentiss Knowlton,
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Pasadena, CA 91101
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Suite #4.

Poly Morphic Hardware, Software, Corrections and Addons.

S. Roger Lewis
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Santa Monica, CA 90405
(213) 396-0048

Biorythms:

Art Childs,
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Glendale, CA 91206
(213) 243-5179

Power supplies:

Fred Schultz,
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(213) 299-4439

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Hawthorne, CA 90250
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Mark Miller
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Chico, CA 95926
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Community Cancer Control
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Secondary Schools:

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(213) 397-38

Commodity and stock price prediction:

Mary Stevens,
11745 Montana Ave., #110,
Los Angeles, CA 90049
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Altair Bus—Si!

By Joe Killian
IMSAI

There seems to be universal agreement that the S-100 bus has some technical problems. The agreement that it should be changed is somewhat less universal. Most people simply bemoan its layout and definition and wish that it had been different. Many of them say they'd buy a better standard if it were out there. Some actively campaign to the effect that some manufacturer should do it and get the ball rolling. Of course no one would complain if some manufacturer did start a new, well designed, standard bus. The industry really would like to switch.

Or would they? The S-100 is not the only bus available in hobbyist systems. Others are marketed that really were designed, and several lack all the faults you can find with the S-100. Notice the stampede over to the best one? . . . oh. Neither has anyone else. What's lacking has to fall into two categories: agreement on which is the best and confidence in the manufacturer(s) to actually truly provide a full range of good equipment.

Only one of these need to be fulfilled to make a product commercially viable. If enough people agreed a particular system was very good, the manufacturer and other manufacturers would support it. If everyone has confidence in availability of complete systems, they'll buy — even if the design is less than perfect. Witness our case with the S-100 bus. In either case, note that the significance of a product with a good bus design depends not on the designer/manufacturer, but on the buyers. ANSI standards, too, typically follow, not lead, a product's acceptance by the market. The manufacturer can't know ahead

of time whether a new product will be accepted. This is not a unique problem we have.

One of the things for proponents of a new bus to notice is the probability of enough agreement to create a standard based on a good design alone. I would place the probability of this at not zero, but low. Certainly, with the support of the industry's major publications, designs could be solicited; polls taken; modifications requested from the designers per the polls; more polls taken; and in 6 months or so we could have a well known bus design designated as "standard". If the same S-100 card size/connector were chosen to solve the chassis problem, a large number of manufacturers would design cards or systems to use it. Support would grow as sales increased. Such a move would be unprecedented, but we have a greater opportunity to do it than has perhaps existed before.

The other possibility is for one or a small group of manufacturers to develop a good bus and enough system support (memory, peripherals, etc.) that many people feel comfortable putting their money into it. Again, support would grow as sales increased.

And there's the catch. No amount of agreement among editors and manufacturers will ever suffice for defining a standard. If the market doesn't buy it, it's effort wasted. You can be sure the manufacturers who stay around will build whatever the market buys; no more, no less. Any manufacturer or group of manufacturers capable of producing a complete system with a new bus will consider the move at least a little bit risky. That will tend to delay the move until it's forced. But then that's the way the world has always worked, how could you expect it to be different this time?

In an effort to make the next step as large as possible, I ask anyone producing a bus system, especially a new one, to publish a complete physical, electrical, timing, and logical description. This should be available to anyone, including "competitors". Don't forget DMA, interrupts, and other 2% functions.

This was written in reply to our request for debate on the Altair Bus in the January Interface—Editor.

Altair Bus—No!

By Daniel Meyer
SWTPC

We do not manufacture computers using the S-100 bus system, or 8080 type processors. Since this bus system and the 8080, Z-80 type processor are not used here, I do not have much to offer in the way of opinions.

The S-100 bus is of course not useful in any way with 6800 type computers such as we make. The SS-50 bus that we use is the most practical for a 6800 system. Due to the more elegant architecture, a 50 pin bus will do anything that is required with a few spares to carry alternate frequency information for interfaces. As far as I am concerned the S-100 is an obsolete bus used with older type processors. Why worry about it?

This was written in reply to our request for debate on the Altair Bus in the January Interface—Editor.

Beware of Substitutes

Is your IMSAI an IMSAI, is your Seals memory board a Seals memory board, etc.? We hear that computer stores often substitute parts in kits and assembled units. For instance, rumor has it that those \$7 edge connectors in many assembled IMSAIs are really \$2 connectors from other stores, or that "Seals" 8K boards are being sold with Fairchild 21L02s substituted for AMD 91L02As, which renders them incapable of battery powered operation.

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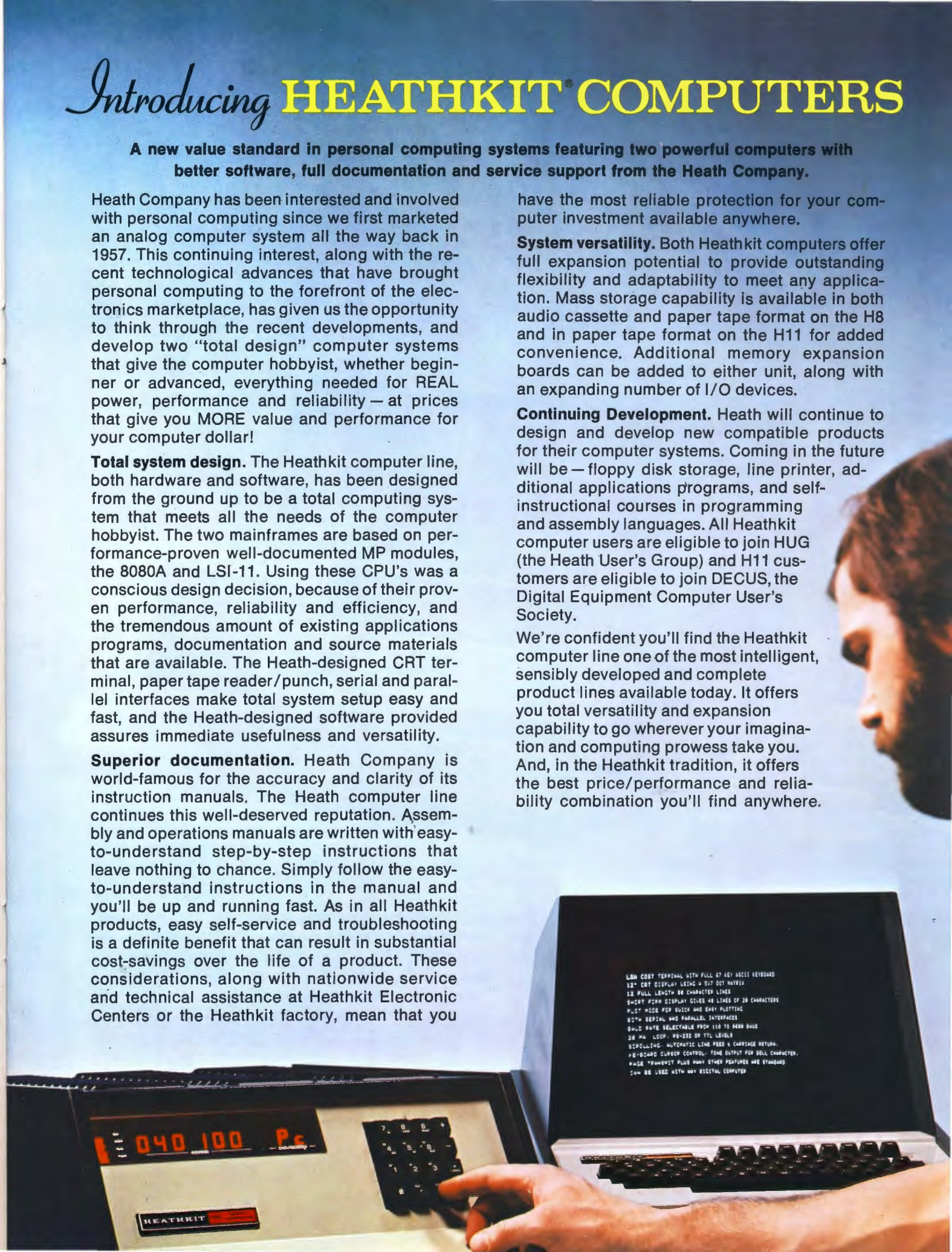
Superior documentation. Heath Company is world-famous for the accuracy and clarity of its instruction manuals. The Heath computer line continues this well-deserved reputation. Assembly and operations manuals are written with easy-to-understand step-by-step instructions that leave nothing to chance. Simply follow the easy-to-understand instructions in the manual and you'll be up and running fast. As in all Heathkit products, easy self-service and troubleshooting is a definite benefit that can result in substantial cost-savings over the life of a product. These considerations, along with nationwide service and technical assistance at Heathkit Electronic Centers or the Heathkit factory, mean that you

have the most reliable protection for your computer investment available anywhere.

System versatility. Both Heathkit computers offer full expansion potential to provide outstanding flexibility and adaptability to meet any application. Mass storage capability is available in both audio cassette and paper tape format on the H8 and in paper tape format on the H11 for added convenience. Additional memory expansion boards can be added to either unit, along with an expanding number of I/O devices.

Continuing Development. Heath will continue to design and develop new compatible products for their computer systems. Coming in the future will be — floppy disk storage, line printer, additional applications programs, and self-instructional courses in programming and assembly languages. All Heathkit computer users are eligible to join HUG (the Heath User's Group) and H11 customers are eligible to join DECUS, the Digital Equipment Computer User's Society.

We're confident you'll find the Heathkit computer line one of the most intelligent, sensibly developed and complete product lines available today. It offers you total versatility and expansion capability to go wherever your imagination and computing prowess take you. And, in the Heathkit tradition, it offers the best price/performance and reliability combination you'll find anywhere.



LOW COST TERMINAL WITH FULL 67 KEY ASCII KEYBOARD
13" CRT DISPLAY USING A HOT COT MATRIX
13" FULL LENGTH 80 CHARACTER LINES
BRIGHT 800M DISPLAY CLES 48 LINES OF 28 CHARACTERS
PLOT MODE FOR QUICK AND EASY PLOTTING
BOTH SERIAL AND PARALLEL INTERFACES
BUILD RATE SELECTABLE FROM 150 TO 9000 BAUD
24 MA LOOP, 05-032 OF TTL LEVELS
SCROLLING, AUTOMATIC LINE FEED & CARRIAGE RETURN
RE-BOARD CURSOR CONTROL, TONE OUTPUT FOR BELL CHARACTER
WIDE TRANSPARENT PLUS MANY OTHER FEATURES ARE STANDARD
CAN BE USED WITH ANY DIGITAL COMPUTER

THE HEATHKIT H8 COMPUTER



A unique, value-packed computer featuring an "intelligent" front panel with built-in extended ROM monitor, octal entry keypad and digital readout, exclusive Heath bus, a pre-wired and tested 8080A-based CPU, and complete systems software at no extra cost!

\$375⁰⁰



HEATHKIT 8-BIT DIGITAL COMPUTER

A low-cost digital computer that's easier to build and to use! Features an intelligent front panel with keyboard entry and 9-digit display, a heavy-duty power supply with enough extra capacity for memory and I/O expansion and

a 50-line fully buffered bus capable of addressing 65K bytes and a mother board with positions for up to 10 plug-in circuit boards. Includes BASIC, assembler, editor and debug software at no extra cost!

The **Heathkit H8 computer** is an 8-bit machine based on the popular 8080A chip. It is one of the lowest-cost general-purpose computers on the market, and thanks to Heath's exclusive design, one of the most versatile.

The **interrupt controlled "intelligent" front panel** gives you far more power and control than is found on conventional units with bit switches and indicators. The 16-digit keyboard allows octal data entry and control that's far faster and less error prone than binary switches. The 9-digit octal readout provides you with more information than conventional models too.

The **octal keyboard and display** emulate a true hardware front panel with complete access to memory, all registers and functions. The 9-digit seven-segment octal display has three readout modes: 6 digits of address and 3 digits data; 6 digits register data and 2 digits register identification; and three digits data with three digits port address. The front panel functions are defined by a panel monitor control program (PAM-8) stored in a 1K x 8 ROM on the CPU board. The complete access to 8080 internal circuits and functions makes the H8 an ideal trainer and learning tool.

Complete front panel functions include: display and alter of memory locations; display and alter of registers; dynamic monitoring of registers or memory during program execution; program execution control including break-point capability and single instruction step; automatic tape load and store through a built-in routine that allows programs to be loaded with a single button; and write or read any I/O port. The front panel of the H8 is so versatile it's like having a mini I/O terminal built right in!

Other features of the H8 front panel include status lights for power-on, run, monitor and interrupt enable; a built-in speaker for audible feedback on keyboard entry. The speaker also can be programmed for variable tones, permitting a variety of special effects to be generated.

The **CPU board** is fully wired and tested. It features the 8080A, clock, systems controller, ROM monitor and full bus buffering. Seven vectored interrupts are available on the bus for quick response to your I/O requests. A built-in clock lets you design and run in real time.

The **H8 uses an exclusive, Heath-designed bus** which incorporates many practical improvements over existing busses. The bus is fully buffered to reduce noise and crosstalk and is "glitch" free to eliminate timing problems. Three-state line drivers and receivers are used on all bus lines to eliminate loading problems. The 50 lines include address, data, control, clock and interrupt lines, plus all signals needed to support the 8080 MPU and virtually any I/O or memory accessory. The bus is implemented on a heavy-duty printed circuit mother board with wide, heavy copper foils for greater physical strength plus reduced crosstalk and noise. The board has 10 positions for installing

connectors that accept the front panel, CPU, memory, I/O and accessory cards. All I/O bus connectors are included with the mother board for fast and easy expansion when you want it.

The **H8's built-in power supply** is convection cooled for adequate ventilation without the use of noisy fans. Separate IC regulators provide distributed regulation with a heat sink on each circuit board for excellent heat dissipation. Power supplies of +8, -18 and +18 volts are provided to handle up to 32k memory plus three I/O interfaces. Switch-selectable 120 V, 60 Hz or 240 V, 50 Hz AC increases versatility.

The **H8 includes all system software** in 1200 baud audio cassette form at no extra charge. The Benton Harbor BASIC™ is an enhanced version of standard Dartmouth BASIC with unique statements and commands to extend usefulness. The efficient compression techniques of the Benton Harbor BASIC permit you to put more program in less space.



All H8 systems software is supplied in audio cassette form. Also available in paper tape (H8-15, page 5) at extra cost.

HASL-8 The Heathkit Assembly language is a 2-pass absolute assembler that lets you program with easily understood mnemonics and generates efficient machine language code. A minimum of 8K memory is required.

The **TED-8** software is a line-oriented text editor used for generating source programs for the assembler or general word processing. Requires a minimum of 8K memory.

The **BUG-8** a powerful terminal console debug program, is an enhanced and extended version of the front panel monitor program to allow entry and debugging of user machine language programs via an external terminal. Requires 3K memory plus user program.

The H8 is housed in a rugged, heavy-duty cabinet, 16¼" W x 6½" H x 17" D. Requires at least one H8-1 Memory.

Kit H8, Shpg. wt. 30 lbs. \$375.00

Suggested applications for the H8 computer: As a trainer—learn microprocessor operation, interfacing and programming. The powerful front panel lets you get at and use all parts of the unit. As an entertainment center—use game and other applications programs for entertainment the whole family can enjoy.

As a hobby computer—the H8 can be used to process any information you program into it—it's perfect for hobby experimentation and design. A variety of peripherals and interfaces let you use it with other equipment—run your Ham radio station, control your model railroad systems, etc.

As an educational system—the H8 is ideal for schools, community colleges, libraries, etc. Full H8 software permits teaching BASIC plus machine and assembly language programming.

As a home management center—use the H8 to keep telephone numbers, monitor your budget, keep your checkbook balanced, do your income taxes, inventory your personal belongings. There are hundreds of ways the H8 can make your life more convenient.



Comprehensive Heathkit assembly and operations manuals give you the superior documentation you NEED for a thorough understanding of your H8.

Systems software is supplied in audio cassette format.



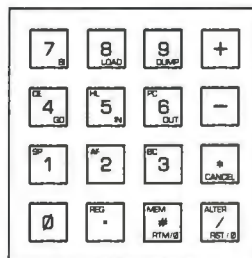
The unique Heath-designed 50-pin bus is implemented on a heavy-duty printed circuit board with heavy copper-foil bus lines. The 10-position mother board is complete with all connectors. The bus lines are fully buffered to eliminate noise and crosstalk, and "glitch-free" to prevent timing problems.

Modular circuit boards slide into the H8 mainframe for easy memory and I/O expansion, easy access for servicing. The boards are in a semi-vertical position with unconfined heat sinks to enhance convection cooling and improve heat dissipation.

Heavy-duty power supply, rugged steel chassis and securely mounted and braced circuit boards make the H8 a truly reliable and long-life machine.

Unique Heathkit Software.

The Heathkit software supplied with the H8 computer has a number of features that make it easier to use and more practical than conventional systems. Automatic "command completion" simplifies typing; dynamic syntax checking instantly alerts you to errors and a special user configuration lets you really personalize your system. H8 software pushes the state-of-the-art a generation ahead — it's memory efficient to give you more computing power for your memory dollar, modular design for easy expansion, and thoroughly documented for easy programming and maximum effectiveness.



Its unique front panel keyboard makes the H8 the most powerful and sophisticated low-cost general-purpose computer available. Just take a look at these features!

- Direct-access to registers and memory even while program is running
- One button load and dump for fast, uncomplicated system startup
- Single instruction key lets you "step" through programs for easy debugging, program evaluation and learning
- Input/output keys let you communicate directly with any port

Memory Display



Register Display



I/O Port Display



H8 "Intelligent" Front Panel

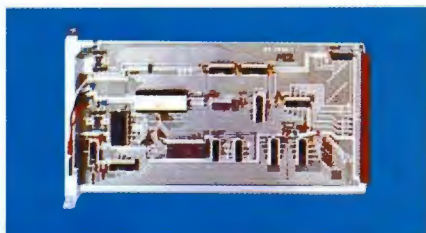
The H8 front panel digital readout is the most informative display available on any personal computer to date. All displays are continuously updated even while your program is executing, giving you instant access to registers and memory for direct monitoring of program activity.

MEMORY DISPLAY — Shows memory location and contents using 6 digits for address and 3 digits for data.

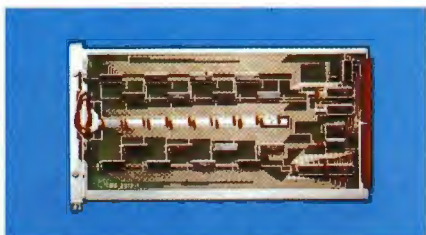
REGISTER DISPLAY — Shows CPU-register contents using 6 digits for data and 2 digits for register identification.

I/O PORT DISPLAY — Shows I/O port data and location using 3 digits for data and 3 digits for port address.

H8 ACCESSORIES, SOFTWARE AND MANUAL SET



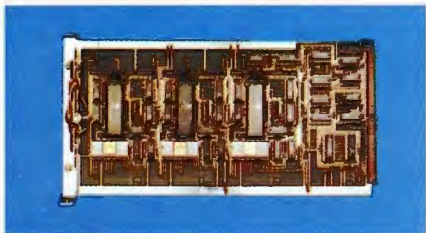
The H8 CPU is fully wired and tested to insure quick and trouble-free system startup. It contains the performance proven 8080A microprocessor chip, a 1Kx8 ROM with monitor program for controlling the front panel and input-output (load-dump) routines. Other features of the CPU include: 7 vectored interrupts, DMA capability, crystal-controlled clock and fully buffered bus with three state drivers. Use of the 8080A, which has the largest software library of any microprocessor, along with Heath software and documentation, makes the H8 one of the most practical and immediately useful computers you can own.



H8-1 Memory Board. 8Kx8 memory card supplied with 4K memory, plugs directly into H8 bus. Features maximum storage capacity of 8192 8-bit words. Uses modern 4Kx1 static memory IC chips for easy assembly and service. Access time, less than 450 nS. With on-board regulators, heat sinks and full buffering. Expandable to 8K memory with H8-3 chip set below.
Kit H8-1, Shpg. wt. 2 lbs.140.00

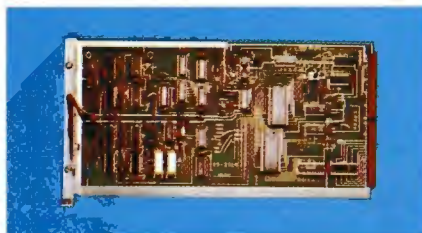
H8-3 Chip Set. Kit of eight 4K static memory IC's. Expands H8-1 to full 8K storage. With sockets.

Kit H8-3, Shpg. wt. 1 lb.95.00



H8-2 Parallel Interface. Connects H8 to any parallel device such as a paper tape reader/punch (required for H10) or line printer. Has three independent parallel ports, each with 8 bits input and 8 bits output and universal handshaking capability. Compatible with all Heath software. 390 μ S maximum transfer time. With diode-clamped inputs, buffered outputs and full interrupt capability.

Kit H8-2, Shpg. wt. 3 lbs.150.00



H8-5 Serial I/O and Cassette Interface. Connects the H8 to serial devices such as the H9 video terminal (page 10) or the H36 DEC Writer II (page 12). Features jumper selectable data rate from 110 to 9600 baud, plus common input/output interfaces including 20 mA current loop and EIA RS-232C compatible levels. The cassette recorder interface permits the use of standard cassette recorders (Heathkit ECP-3801, page 12). Uses the popular Byte/Manchester or "Kansas City" standard recording format with a 300 or 1200 baud read/record rate. Control lines for remote start and stop of two cassette units allow separate record and playback for easy program or file editing. Also has full interrupt capability. LED test circuit for easy board setup and overall system servicing. Fully compatible with all Heath software.

Kit H8-5, Shpg. wt. 3 lbs.110.00

NOTE: Proper operation of the H8-5 is assured only if you use the Heath ECP-3801 cassette player/recorder and Heath-recommended recording tape (ECP-3802, page 12). Heath is not responsible for improper operation associated with other cassette units.

Extended Benton Harbor BASIC

Extended Benton Harbor BASIC is an enhanced and more powerful version of the BASIC supplied with the H8. It provides even faster operation and includes character strings, additional convenience commands and math functions, dynamic storage allocation, access to real time clock, keyboard interrupt processing, expanded error messages and recovery ability, LED display control and key pad support. A minimum of 12K memory is required to run this BASIC, 16K is preferred if full use is to be made of its capabilities.

H8-13 (1200 baud audio cassette)
Shpg. wt. 1 lb.10.00

H8-14 (fan fold paper tape)
Shpg. wt. 1 lb.10.00

Paper Tape Systems Software

A paper tape version of the systems software supplied with the H8 computer. It consists of four fan fold paper tapes, one each for Benton Harbor BASIC, HASL-8 assembler, TED-8 editor, and BUG-8 debug. For use with the H10 paper tape reader/punch or other paper tape I/O equipment.

H8-15, Shpg. wt. 1 lb.20.00

H8 Manual Set

Find out about the H8 before you buy! This manual set includes the complete assembly and operations manuals for the H8 Digital Computer, H8-1 memory card, H8-2 parallel interface, H8-3 4K memory expansion chip set, H8-5 serial and I/O cassette interface, H9 video terminal and H10 paper tape reader/punch. H8 software documentation covering monitor, editor, assembler, debug and BASIC is also included. In handsome 3-ring binder.

HM-800 Manual Set.

Shpg. wt. 11 lbs.25.00

The purchase price of the HM-800 manual set will be refunded when you buy the H8. Simply include HM-800 saleslip with your order.

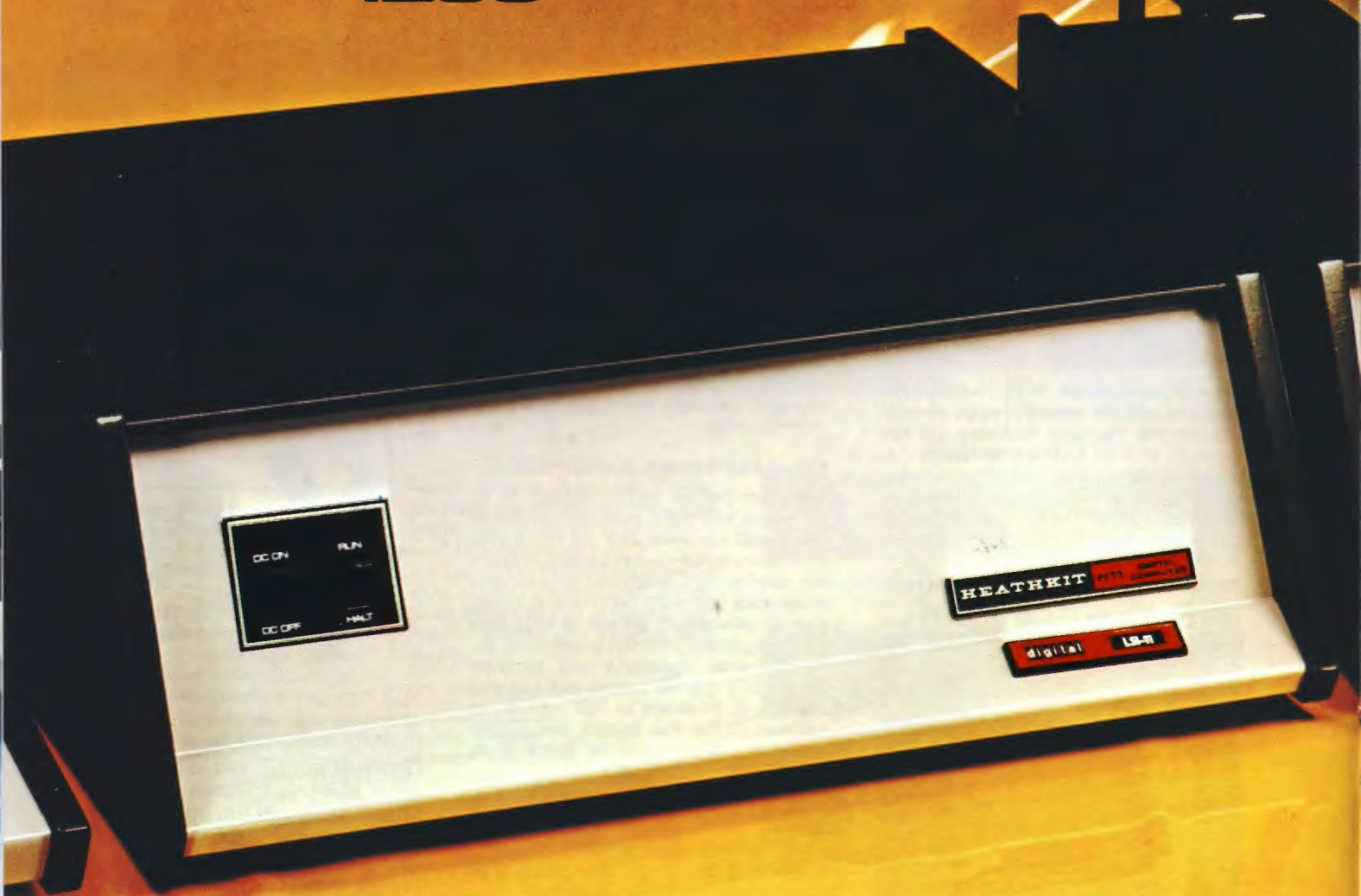


You can get even more excitement and practical use from your H8 by joining HUG, the Heathkit User's Group. It will put you in contact with other Heathkit computer users, provide a program library and an informative newsletter to keep you up to date. A HUG application is enclosed with each Heathkit computer product. See page 12 for further details.

THE HEATHKIT H11 DIGITAL COMPUTER

Two of the finest names in modern electronics, Heath and Digital Equipment Corporation (DEC) combine to bring you the world's first 16-bit computer priced within reach of the general public!

\$1295⁰⁰



The H11 and all its accessories
will be available November 10th, 1977.

HEATHKIT®/DIGITAL EQUIPMENT CORPORATION®

H11 DIGITAL COMPUTER

Heath and DEC join forces to bring you mini-computer performance at a microcomputer price! The H11 features a fully wired and tested DEC KD11F board that contains the 16-bit LSI-11 CPU, 4096 x 16 read/write MOS semi-

conductor memory, DMA operation; and includes the powerful PDP-11/40 instruction set, PLUS Heath/DEC PDP-11 software. Equivalent commercial versions of the H11 would cost \$1,000's of dollars more!

The new Heath/DEC H11 personal computer is one of the most powerful and sophisticated units available today! It combines the advanced, performance-proven hardware and software of the LSI-11 with Heath's expertise in kit design and documentation to bring you a personal computer of almost incredible power and flexibility. Equivalent commercial versions of the H11 would cost over twice as much, and you still wouldn't get the superior documentation and support of the H11!

The LSI-11 bus is a mechanically and electrically superior bus with 38 high-speed lines containing data, address, control and synchronization lines. Sixteen lines are used for time multiplexing of data and addresses. All data and control lines are bidirectional, asynchronous, open-collector lines capable of providing a maximum parallel data transfer rate of 833K words per second under direct memory access operation.

The 16-bit CPU functions are contained on four MOS LSI integrated circuit chips. These chips provide all instructions, decoding, bus control, and ALU functions of the processor. The CPU has eight general registers which serve as accumulators, index, autoincrement/autodecrement registers or stack pointer.

The KD11F memory is a 4096-by-16 MOS semiconductor memory composed of LSI 4K dynamic RAM chips. These chips require little power, provide fast access time, and are refreshed automatically by the processor's microcode. Additional memory cards can be added to expand memory capacity up to 20K in the H11 cabinet (32K words total).

The backplane/card guide assembly holds the microcomputer and up to six I/O and memory modules. All LSI-11 bus data, control, and power connections are routed on the printed circuit backplane to each module location. The backplane/card guides are fully compatible with all standard DEC LSI-11 accessories.

An efficient, well-designed switching power supply provides the required DC voltage for the LSI-11 as well as all accessory modules. The supply features overvoltage and overcurrent/short-circuit protection, power fail/automatic restart and a built-in fan for quiet cooling. The dual primary power configuration can be connected for 115 V, 60 Hz or 230 V, 50 Hz input power.

Has single-level, vectored, automatic priority interrupt, real-time clock input signal line, ODT/ASCII console routine/bootstrap resident in microcode for automatic entry into debugging mode, replacement of panel lights and switches with any terminal device generating standard ASCII code, and the ability to automatically commence operation through resident bootstrap routines.

The H11 is supplied with versatile PDP-11 software including editor, relocatable assembler, linker, absolute loader, debug program, I/O executive program, dump routines, BASIC and FOCAL (See details below). The software requires a minimum of 8K memory, with 12K to 16K total memory recommended for maximum capability. Rugged metal cabinet measures 6½" H x 19" W x 17" D. For 110/220 VAC, 50/60 Hz.

Kit H11, Shpg. wt. 34 lbs. 1295.00
NOTE: See DEC software license form on page 15.

POWERFUL HEATH/DEC PDP-11 SOFTWARE AT NO EXTRA COST!

The H11 includes a sophisticated software system that lets you get your computer up and running with practical programming capabilities. This paper tape based software would cost over \$1200 if purchased separately. A minimum of 8K memory is required to run the software. The programs include:

ED-11. Assists you in the creation and modification of ASCII source tapes, also used to write assembly language programs and for general text editing or word processing functions.

PAL-11S. Relocatable assembler converts ASCII source tapes into relocatable binary modules. This lets you create programs in small, modular segments for easier coding and debugging. These binary modules serve as inputs to LINK-11S.

LINK-11S. Link editor which links the modules created by the PAL-11S into a load module ready for execution on the H-11. The module is loaded into the H-11 via the Absolute Loader.



The H11 is complete with superior Heathkit documentation and versatile system software.

Absolute Loader. Loads absolute binary tapes into the H11 memory for execution.

ODT-11X. Lets you debug the programs which you have created. Permits modifying and controlling program execution "on the fly" for quick, efficient debugging.

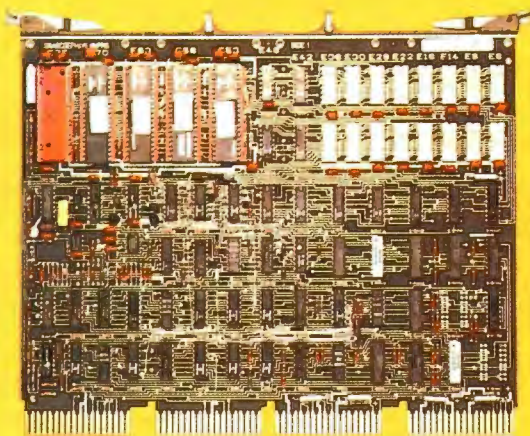
IOX. I/O executive program permits I/O programming without developing device-driving programs. Links to your programs using the LINK-11S. For use with high speed paper tape reader/punch and line printer.

DUMP-AB and DUMP-R. Lets you dump absolute binary contents of memory into the paper tape punch.

BASIC. DEC's powerful version of standard Dartmouth BASIC interpreter uses english-type statements and mathematical symbols to perform operations. Immediately translates, stores and executes the program. Includes string capability.

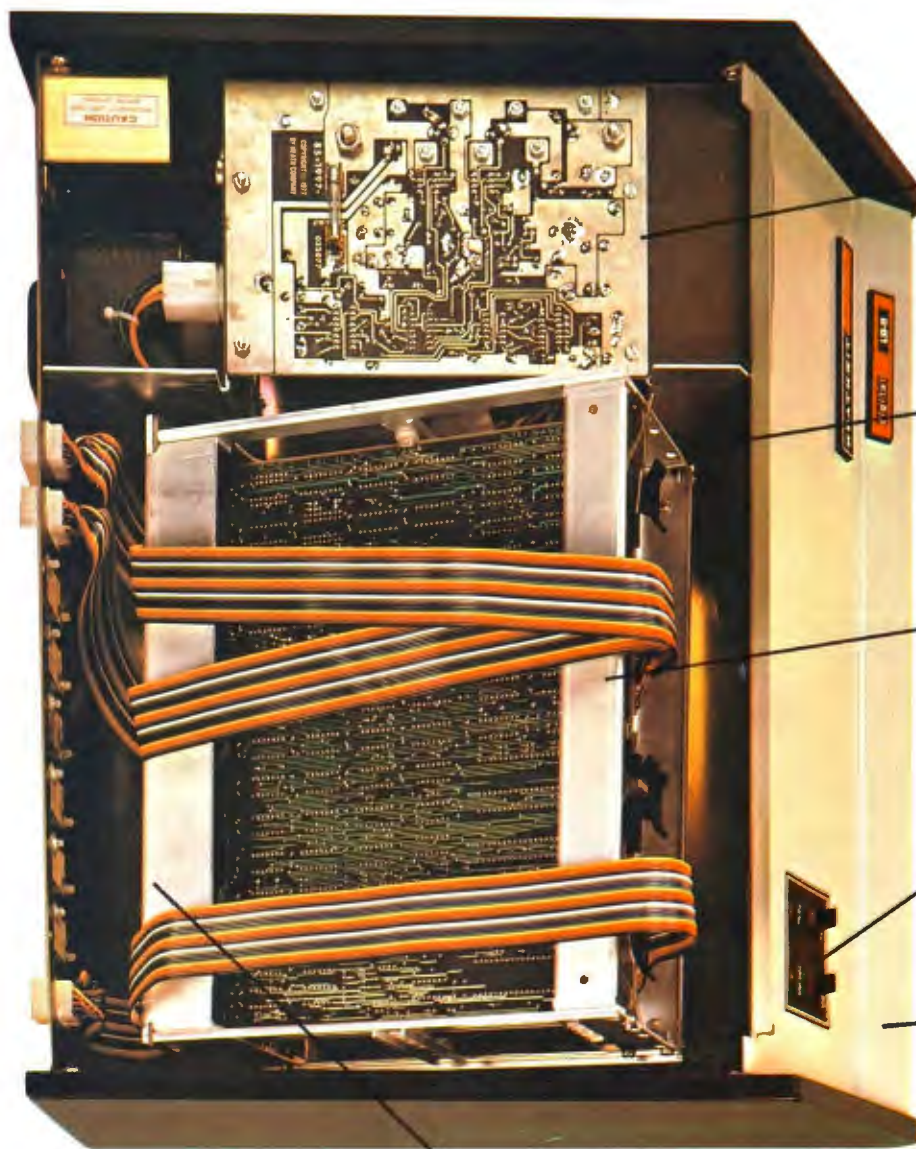
FOCAL™. DEC's own interpretive computer language which combines simplicity with computing power. Ideal for most scientific, engineering and math applications. FOCAL™ programs can be written and executed easily. Both 4K and 8K versions are included.

NOTE: H11 owners are eligible for membership in the Digital Equipment Computer User's Society (DECUS). This organization provides useful symposia, newsletters, program library and other useful information to help you get the most from your LSI-11 computer.



FULLY WIRED AND TESTED KD 11F BOARD

The "heart" of the H11 computer is the standard DEC LSI-11 microcomputer board. The 16-bit CPU functions are contained in four silicon gate N-channel MOS LSI integrated circuit chips for high reliability and superior performance. The 4096-by-16 read/write MOS semiconductor memory is composed of LSI 4K dynamic RAM chips that provide fast access time and require little operating power. The CPU executes the powerful PDP-11/40 instruction set with over 400 instructions. There are no separate memory I/O or accumulator instructions, so you can manipulate data in peripheral device registers as easily and flexibly as in memory registers. The LSI-11 board is supplied fully wired and tested to facilitate kit assembly and provide greater reliability and less chance of error.



Compact, efficient switching power supply uses less power to operate and generates less heat than conventional supplies. Overvoltage and overcurrent/short circuit protection, along with automatic power-up and power-down sequencing, provide high reliability and long life operation.

Built-in quiet-running fan provides efficient cooling and prevents heat buildup.

Card cage with backplane accommodates up to six accessory cards in addition to LSI-11. The card cage swings up for easy access and service even while the H11 is operating. Accessory boards slide directly into card guides with all connectors supplied.

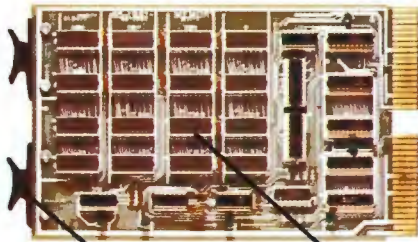
Front panel controls include DC power switch and run/halt switch. Status lights indicate processor activity.

Styled and sized to match Heathkit peripherals for total system continuity.

Rugged steel chassis and extra-thick backplane with heavy, solid connectors for added strength and years of superior performance.

The H11 and all its accessories will be available November 10th, 1977.

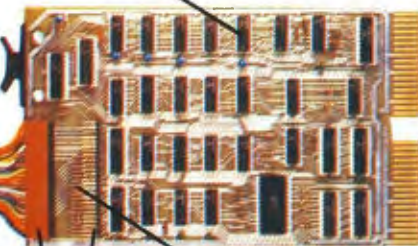
H11 ACCESSORIES, SOFTWARE AND MANUAL SET



Card handles provide easy removal and insertion in card cage

Sixteen state-of-the-art 4K static memory chips for high density storage

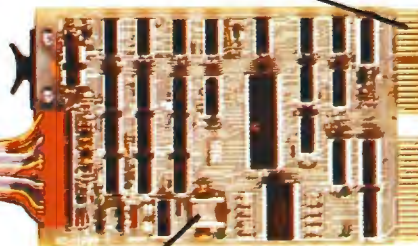
All IC's are socketed for easy kit assembly, easy access for service or troubleshooting



All inputs are diode-clamped for worry-free interfacing and system protection

Separate cables and rear panel connectors for high-byte and low-byte increase system flexibility

Gold-plated edge connectors maintain superior electrical contact for high reliability and long life



Quartz crystal and integrated baud rate generator has superior accuracy for reliable system interfacing

1 H11-1 4K Memory Expansion Module

Plugs into H11 backplane, adds 4K x 16-bit word capacity to H11 memory. Uses high-reliability 1Kx4 static MOS RAM chips. Access time is less than 500 nS. Has decode circuitry for operation on 4K address boundaries. Handle for easy removal and insertion. Compatible with PDP 11/03 and other LSI-11 backplane machines.

Kit H11-1, Shpg. wt. 2 lbs. 275.00

2 H11-2 Parallel Interface

General-purpose parallel interface featuring 16 diode-clamped latched data input lines, 16 latched output lines, 16-bit word or 8-bit byte data transfers. Has LSI-11 bus interface and control logic for interrupt processing and vectored addressing; control status registers compatible with PDP-11 software routines. Four control lines for output data ready, output data accepted, input data ready and input data accepted logic operations. Maximum data transfer rate, 90K words per second under program control. Maximum drive capability, 25-ft. cable. Plugs into H11 backplane, can be used with DEC PDP-11/03 and other LSI-11 backplane machines. Also compatible with TTL or DTL logic devices. The H11-2 is required for interfacing the H11 to the H10 Paper Tape Reader/Punch.

Kit H11-2, Shpg. wt. 2 lbs. 95.00

3 H11-5 Serial Interface

Universal asynchronous receiver/transmitter serial interface module for use between LSI-11 bus and serial devices such as the Heathkit H9 video terminal (page 10) or LA36 teleprinter (page 12). Has optically isolated 20 mA current loop and EIA interfaces; selectable baud rates of 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800 and 9600. Plugs into H11 backplane, fully compatible with PDP 11/03 and other LSI-11 backplane machines. With all mating connectors.

Kit H11-5, Shpg. wt. 2 lbs. 95.00

H11-6 Extended Arithmetic Chip

Adds powerful arithmetic instructions to the LSI-11, including fixed point multiply, divide and extended shifts plus full floating point add, subtract, multiply and divide. Helps minimize or eliminate arithmetic sub-routines, speeds up program execution and eases program development. Saves memory space too. 40-pin dual-inline package IC plugs into socket on KD11F board.

H11-6, Shpg. wt. 1 lb. 159.00

Manual Set for H11 Computer

Includes complete assembly and operation manuals for the H11 Digital Computer, H11-1 4K memory board, H11-2 parallel interface, H11-5 serial interface, H9 CRT terminal, and H10 paper tape reader/punch. Also includes complete software documentation — monitor, editor, assembler, linker, BASIC, FOCAL and related software. In handsome 3-ring binder.



ware documentation — monitor, editor, assembler, linker, BASIC, FOCAL and related software. In handsome 3-ring binder.

HM-1100 Manual Set, Shpg. wt. 12 lbs. 25.00

NOTE: The price of the manual set can be deducted when you order an H11.

NOTE: DEC, DIGITAL, FOCAL and PDP are registered trademarks of Digital Equipment Corporation.

Special DEC Software License Requirement

H11 purchasers are required to fill out and sign the DEC license agreement on page 15. Please do so and include with your H11 order. Heath cannot ship merchandise without this license agreement.

THE HEATHKIT H9 VIDEO TERMINAL

One of the lowest-cost full ASCII terminals available anywhere—features a bright 12" CRT display with twelve 80-character lines, 67-key keyboard, all standard serial interfaces, plus a fully wired and tested control board and a wiring harness for simplified assembly.

\$530⁰⁰



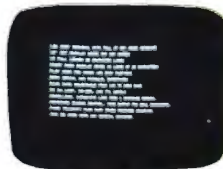
LOW COST TERMINAL WITH FULL 67 KEY ASCII KEYBOARD
12" CRT DISPLAY USING A 517 MT TUBE
12 FULL LENGTH 80 CHARACTER LINES
SHORT FORM DISPLAY GIVES 48 LINES OF 20 CHARACTERS
PLAT MADE FOR QUICK AND EASY PLATING
BOTH SERIAL & PARALLEL INTERFACES
BAUD RATE SELECTABLE FROM 110 TO 9600 BAUD
20 MA. LOOP, RS-232C, AND TTL LEVELS
SCROLLING, AUTOMATIC LINE FEED & CARRIAGE RETURN
KEYBOARD CURSOR CONTROL, TONE OUTPUT PER LINE CHARACTER
PAGE FORWARD PLUS MANY OTHER FEATURES
CAN BE USED WITH ANY DIGITAL COMPUTER

H9 LONG AND SHORT-FORM VIDEO DISPLAY TERMINAL

The H9 video terminal is a general-purpose computer peripheral designed for use with the Heathkit H8 or H11 computers. It provides keyboard input and a CRT for the convenient entry and display of computer programs and data. The H9 can be used with any digital computer in dedicated stand-alone applications or in time-sharing systems.

Character format is standard upper case 5 x 7 dot matrix. The long form display is twelve 80-character lines. The short form display is forty-eight 20-character lines in four 12-line columns. The automatic line carryover feature executes line feed and return when line exceeds character count on both long and short form displays. A built-in oscillator/speaker generates a 4800 Hz tone and serves as audible end-of-line warning.

Auto-scrolling is featured in both long and short form. In the long form, as the line enters at bottom, the top line scrolls off-screen; in the short form, as new column enters from right, the left column scrolls off-screen. Auto-scrolling can be



Long form—twelve 80-character lines



Short form—forty-eight 20-character lines

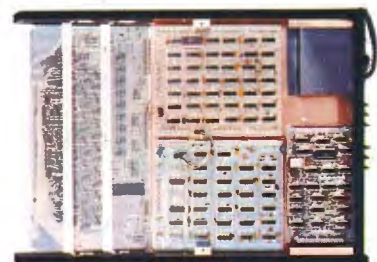


Plot mode—graphs, curves, simple figures

Three separate modes give the H9 real display versatility

defeated with a front panel switch. The cursor mark indicates the next character to be typed for accurate positioning. Cursor control keys include up, down, left, right and home. Serial data baud rates are selectable from 110-9600. Baud rate clock output and reader control are available on the rear panel connector. The erase mode permits automatic full page erase or erase to end of line starting at cursor position. A transmit page function allows a full page to be formatted, edited and modified, then transmitted as a block of continuous data.

The plot mode permits graphs, curves and simple figures to be displayed. Plot-



Control PC board is fully assembled and tested for added reliability and simplified kit assembly. A wiring harness with connectors helps reduce time-consuming point-to-point wiring.

ting can be accomplished via the keyboard or from external inputs.

The H9 serial interface provides EIA RS-232C levels, a 20 mA current loop or standard TTL levels. Parallel interfacing includes standard TTL levels, 8 bits input and 8 bits output and 4 handshaking lines.

Ultra-compact size, only 12½" H x 15¾" W x 20¾" D, makes the H9 ideal for desktop or console applications. For 110 VAC, 60 Hz or 230 VAC, 50 Hz.

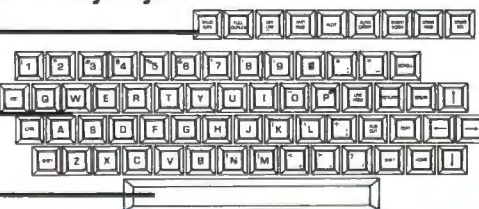
Kit H9, Shpg. wt. 50 lbs. **530.00**

Full ASCII 67-key Keyboard

Function keys are positioned away from characters to prevent miskeying and error.

Standard typewriter keyboard for easy, more accurate input.

Wide, easy-to-use space bar aids accurate typing.





THE HEATHKIT H10 PAPER TAPE READER/ PUNCH

A general-purpose mass storage peripheral designed for use with the H8 and H11 computers plus any other computer. Features a heavy-duty built-in power supply, totally independent punch and reader and a copy mode for fast, easy tape duplication.

\$350⁰⁰



H10 DELUXE PAPER TAPE READER/PUNCH



Heavy-duty solenoids for reliable, long-life operation

Precision machined punch block for accurate, consistent punched holes

Advanced reader design with stepper motor and solid-state sensors for accurate reading

or uncoiled) paper tape to be used. Sensitive photo Darlington transistors and an incandescent lamp reader head provide reliable reading. The powerful stepper motor drive insures accurate tape positioning and movement.

The punch operates at a maximum speed of 10 characters per second. Precise ratchet/solenoid drive and reliable solenoid control of punches provide high-accuracy punching. The precision die-block punch head gives you positive and consistent punching.

Controls include power on-off, read and punch start. A feed control feeds blank paper tape through the punch to produce leader tape. A copy control on the rear panel permits tape being read to be duplicated by the punch for efficient and accurate tape copying.

The H10 is a complete paper tape reader/punch mass storage peripheral using reliable low-cost paper tape. It's fully compatible and styled to match with the H8 and H11 computers. It also works reliably with any other computer through a parallel interface. The H10 uses standard 1" wide roll or fan-fold 8-level paper tape. Standard punched paper tape gives you the reliability, durability and trouble-free handling you need for effective mass storage of programs and data.

The reader reads tape at a maximum rate of 50 characters per second. A full sensitivity adjustment on each channel permits any color, thickness, quality (oiled

Interface has parallel 8-bit input bus for punch, parallel 8-bit output bus for reader, standard TTL logic levels and handshaking lines for both reader and punch. A rear panel 24-pin interface connector and mating cable are supplied. The H10 is fully compatible with Heathkit H8 and H11 computers when the appropriate parallel interface accessories are used. It can also be interfaced with other computers with parallel interface facility.

Accessories include holder for roll paper tape, chad collector tray, and collector box for fan-fold tape. With 8" roll (900 ft.) blank paper tape.



Styled to match the Heathkit H8 and H11 computers. Cabinet with metal top and rugged steel chassis, 12 $\frac{5}{8}$ " H x 9 $\frac{3}{4}$ " W x 19 $\frac{5}{8}$ " D. For 110-130 VAC, 60 Hz, or 220-240 VAC, 50 Hz.

Kit H10, Shpg. wt. 29 lbs. **350.00**

H10-2, Three Blank Rolls Paper Tape, each 8" diameter, 900 ft. min.

H10-2, Shpg. wt. 5 lbs. **10.00**

H 10-3, Three Boxes Blank Fan-fold Tape. Approx. 1000 ft. each.

H10-3, Shpg. wt. 5 lbs. **10.00**



ECP-3801 Cassette Recorder Storage Device

Has volume and tone controls, pushbuttons for record, play, rewind, fast forward, stop and eject, built-in 3-digit counter with reset button. Factory wired, not a kit.

ECP-3801, Shpg. wt. 6 lbs. **55.00***

Heath recommended high output, low noise, premium grade audio recording tape. Pack of three 30-minute blank cassettes.

ECP-3802, Shpg. wt. 1 lb. **per pack 5.00**

*NOTE: Proper operation of the H8-5 and H8 software is assured only when the ECP-3801 cassette recorder and ECP-3802 tape is used. Heath does not assume responsibility for improper operation resulting from the use of any other cassette units.

HUG®—the Heathkit User's Group

Our new user's group brings you in contact with other Heathkit computer owners and users, provides a newsletter, a program library, new product information and hardware/software ideas. Membership in HUG is a useful, practical way to get the maximum enjoyment and benefit from your Heathkit computer system. Here's what you get:

- 1 year subscription to the quarterly newsletter
- Software library allowing you to submit programs and obtain programs submitted by others. A modest fee will be charged for software duplication.
- An attractive 3-ring binder to hold newsletters, software documentation and other materials.
- Program submission forms • Software library catalog
- HUG membership list • Credit toward purchase of software

Dues are \$14.00 for one year. Complete details of HUG membership are included with every Heathkit computer product. H11 owners are also eligible for membership in DECUS, see page 7 for details.

Heathkit 12

LA36 DEC Writer II Keyboard Printer Terminal

The famous LA36 DEC Writer II with true 30-cps throughput, variable-width forms handling, 128-character upper/lower case set, and extra-quiet operation. Fully assembled, factory tested and ready to use!

The LA36 is an advanced technology teleprinter offering fast, reliable operation at one of the best price/performance ratios in the industry. It features a 7x7 dot matrix print head for crisp, clear character formation; switch-selectable 10, 15 and 30 cps printing speeds; variable width forms handling from 3 to 14 7/8" wide; adjustable right and left hand tractors for precise margin positioning; half or full duplex operation; ANSI-standard multi-key rollover and a typewriter-like keyboard.

The precision-designed stepper motor paper feed has fine vertical adjustment for accurate forms placement. LA36 will handle up to 6-part forms with a .020" maximum pack thickness. Print format is 132-column, with 10 characters per inch horizontal spacing and 6 lines per inch vertical spacing. Uses the entire 128 character ASCII upper/lower case set with 95 printable characters. A CAPS-lock key simplifies data entry. A parity check on output prints a replacement character, strappable to odd, even, or none with mark or space. A last-character visibility feature moves the head four columns to the right when printing stops, returns to proper position when printing is resumed.

The integral 20 mA current loop interface makes the LA36 compatible with both the H8 and H11 computers, as well as all other hobby and personal computers. Operates on 90-132 VAC or 180-264 VAC for reliable performance even under brown-out conditions. With connecting cable and integral stand for easy setup. Overall size, 27 1/2" W x 33 1/4" H x 24" D.

H36 (LA36 DEC Writer II) Shipped Motor Freight, prepaid to your nearest terminal within the Continental U.S. Include your phone number on order for notification of arrival. Arrangements for home delivery at extra charge at your option. **NO C.O.D. ORDERS ACCEPTED.** **\$1495.00**

H36-1 Fan-fold paper for H36. Standard 14 7/8" x 11" white and green, single part, lined paper. 3450 sheets per carton.

H36-1, Shpg. wt. 50 lbs. **30.00**

H36-2 EIA Interface. Provides EIA RS232-C or CCITT-V24 interface for LA36. Includes auto answer, timed disconnect and half/full duplex logic. Straps are available to send timed break (230 mS), 3000 mS long space, forced disconnect or do nothing (stops printing, discards data) on a paper-out condition. Modem controls and a 9-ft. cable with 25-pin data-set type connector are also supplied. Factory wired, not a kit.

H36-2, Shpg. wt. 1 lb. **65.00**

APPLICATIONS SOFTWARE—COMING SOON!

Both the H8 and H11 Digital Computers are supplied with complete systems software that provide you with everything you need to develop your own specific applications programs. However, you can make your computer immediately useful by using the programs below. These programs represent the beginning of a complete series of application software packages that will allow you to get immediate value from your computer system without a time consuming software development effort on your part. Described below are a series of game packages that make your computer an excellent source of entertainment and leisure time activities.

BLACKJACK. An interactive program game that allows four players to play the card game blackjack on the computer. The computer performs all of the functions of the dealer and keeps track of player progress, winnings and losses. The program is written in and runs under extended BASIC and requires a minimum of 16K of RAM in the H8 and 8K in the H11. Standard Las Vegas casino blackjack rules apply.

BIORHYTHM. This popular applications program computes standard biorhythm information and plots sinusoidal curves of your physical, emotional, and intellectual characteristics over a given time period. The biorhythm program will show you your ups and downs and will tell you your good and bad days. It will help you plan your activities. While this program is not a game, it is an entertaining activity that you and your friends and family will enjoy. The program runs under extended BASIC and requires 16K of RAM in the H8 and 12K RAM in the H11.

STARTREK. Startrek is perhaps the most popular computer game available. It allows you to guide, control and command the Starship Enterprise in its travels through the galaxy, fighting Klingons and solving a variety of problems. A truly challenging, sophisticated and entertaining computer game. Runs on the H8 or H11 computers with 8K of RAM or more.

GAME SET #1. This software package lets you play 8 popular computer games. These games include Craps, Orbit, Tic Tac Toe, Nim, Hexapawn, Hangman, Hmrabi, and Derby. 8K RAM or more is required on either the H8 or H11. These games will provide hours of entertainment for you and your family.

GAME SET #2. Another popular game package for the H8 and H11 computers. Contains 8 popular computer games including bagles, slot machine, gomoko, yachtze, apollo, gunner, wumpus, and cube.

AVAILABILITY. Blackjack, Biorhythm and Startrek will be available after October, 1977. Game Set #1 will be available November, 1977 and Game Set #2 available, February, 1978.

Order a complete Heathkit computer system and SAVE!



The ECP-3801 is the Heath-recommended cassette recorder/player for use with the H8 computer software. See opposite page for complete description.

SYSTEM ONE

The minimum recommended H8 system

H8 Computer	\$375
H8-1 4K Memory	140
H8-3 4K Chip Set	95
H8-5 Serial I/O and Cassette Interface	110
H9 Video Terminal	530
ECP-3801 Cassette Recorder/Player	55

If purchased separately, \$1305.00

Heath System price is **\$1239⁷⁵***

Choose any of the Heath-recommended systems shown here, the specially-priced HS-11 system below, or "roll your own" with a selection of products you choose. Any way you do it, you'll get a top-value, high-performance system, and you'll SAVE 5%! Here's how to qualify for the 5% computer systems discount:

1. Select either the H8 or H11 and one major peripheral (H9, H10 or LA36).
2. Choose the I/O interface, memory and software accessories you need.
3. Specify each in the spaces provided on the order blank.
4. Deduct 5% from the total price of the products (excluding shipping and handling charges).

*Systems illustrated already have discount prices calculated for you.

From time to time, Heath will offer specially priced total systems such as the HS-11 below. These systems will be discounted even deeper than 5% to provide you with even MORE value for your computer dollar!

SYSTEM TWO

H8 Computer	\$375
Two H8-1 4K Memories	280
Two H8-3 4K Chip Sets	190
H8-5 Serial I/O and Cassette Interface	110
H8-13 Extended BASIC in Cassette Format	10
H9 Video Terminal	530
ECP-3801 Cassette Recorder/Player	55

If purchased separately, \$1550.00

Heath System price is **\$1472⁵⁰***



SYSTEM THREE

The minimum recommended H11 system

H11 Computer	\$1295
H11-1 4K Memory	275
H11-2 Parallel Interface ..	95
H11-5 Serial Interface	95
H9 Video Terminal	530
H10 Paper Tape Reader/Punch	350

If purchased separately, \$2640.00

Heath System price is **\$2508⁰⁰***

SYSTEM FOUR

SAVE EVEN MORE on this specially-priced Heath HS-11 complete computer system!

H11 Computer	\$1295
H11-1 4K Memory	275
H11-2 Parallel Interface ..	95
H11-5 Serial Interface	95
H10 Paper Tape Reader/Punch	350
H36 LA36 DEC Writer II	1495

If purchased separately, \$3605.00



\$3350⁰⁰*

YOU SAVE \$255!

NEW HEATHKIT SELF-INSTRUCTIONAL COMPUTER COURSES

These Heathkit self-instructional courses are designed to help you get the most from your computer investment, whether you buy your computer hardware from Heath or anywhere else. While many pre-developed software programs are available, the only way to realize the full value of your personal computer is to learn programming yourself. These courses use the PROVEN Heathkit individual learning techniques to give you a thorough understanding of programming, even if you have no prior knowledge or experience. They'll show you exactly how to make your personal computer system really personal!



BASIC PROGRAMMING SELF-INSTRUCTIONAL COURSE

This course teaches you how to program your computer using the popular BASIC language. BASIC (Beginner's All-Purpose Symbolic Instruction Code) is essential for hobby and personal computing; it is also widely used in education and business. The course covers all formats, commands, statements and procedures plus the creative aspects of computer programming, so you can make practical use of it in solving problems and creating your own unique programs. Like other Heathkit self-instructional courses, it uses programmed instructions backed by practical hands-on computer experiments and demonstrations to reinforce and personalize the text material. An optional final exam (passing grade 70%) brings you a Certificate of Achievement and 3.0 Continuing Education Units*. While the BASIC course is keyed to Heathkit computers, it is also equally applicable to any computer system using BASIC. Available after Oct. 20th, 1977.

EC-1100, Shpg. wt. 6 lbs.29.95

*Continuing Education Units (CEU's) are nationally recognized means of acknowledging participation in non-credit adult education.

COMING SOON!

8080 Programming: Teaches you the machine and assembly language used with 8080-based computers. Shows you how to use the editor, assembler and debug software to create efficient programs. Ideal for the H8 and other 8080A based machines. Coming soon.

LSI-11 Programming: Shows you how to use editor, assembler, linker, debug and executive I/O software to create efficient programs. Applicable to H11 and most other Digital Equipment Corporation PDP-11 series computers. Coming soon.



COMING IN OCTOBER!

MICROPROCESSOR SELF-INSTRUCTIONAL COURSE

Learn how microprocessors operate and how to design with them. Covers applications, machine language programming, hardware I/O interfacing and much more. The course includes all IC's needed to perform exciting experiments. The microprocessor trainer used with the course features the popu-

lar 6800 microprocessor plus 256 bytes of RAM, a 1K ROM monitor, 6-digit hexadecimal display and hexadecimal keyboard. The Heathkit microprocessor course/trainer combo is the fast, easy low-cost way to learn about these important devices. Watch for it in our next catalog!

GENERAL COMPUTER BOOKS

Microcomputer Dictionary and Guide (Matrix). Comprehensive source of definitions and basic information on computers and related topics. A super reference source. A must for your library. EDP-21817.95

Introduction to Microcomputers Vol. I (Osborne). Excellent introduction to microcomputers and fundamental computer concepts. EDP-2247.50

Introduction to Microcomputers Vol. II (Osborne). Complete descriptions of all popular microprocessors, 8080, 6800, 6502, SC/MP, Z80, F8, 2650, etc. Good reference. EDP-22512.50

How to Buy and Use Minicomputers and Microcomputers (Sams). A fundamental text on mini/micro operation and application. EDP-2279.95

TV Typewriter Cookbook (Sams). Good text explaining I/O terminals, interfacing, etc. EDP-2269.95

8080 BOOKS

Build a library to support your H8 computer or any 8080 based machine.

Bugbook III (E & L). Superior reference source on 8080 interfacing and programming. Includes experiments. EDP-23115.00

Bugbook IIA (E & L). Serial I/O concepts and terminal interfacing. EDP-2325.00

8080 Programming for Logic Design (Osborne). Programming and Using the 8080 microprocessor. EDP-2297.50

8080 Software Gourmet Guide and Cookbook (Scelbi). Excellent source for 8080 programs and subroutines. EDP-2289.95

Practical Microcomputer Programming: 8080 (Northern Technology). Machine/Assembly programming concepts for the 8080. EDP-23521.95

6800 BOOKS

Great reference sources for your 6800 based computers.

6800 Programming for Logic Design (Osborne). Programming and using the 6800 microprocessor. EDP-2307.50

6800 Software Gourmet Guide and Cookbook (Scelbi). Excellent source of commonly used 6800 programs. EDP-2339.95

6800 Microprocessor Applications Manual (Motorola). Comprehensive review of typical 6800 applications, design solutions, etc. EDP-24425.00

6800 Microprocessor Programming Manual (Motorola). Programming principles and examples for the 6800. EDP-24510.00

H11/LSI-11/PDP-11 BOOKS

Here are several important reference sources to help you get the most value from your H11 Computer.

Minicomputer Systems: Organization and Programming (Prentice-Hall). Good basic text. Emphasis on the PDP-11. EDP-23817.95

PDP-11 Programming (Algonquin). A programmed instruction text teaching the concepts of PDP-11 operation and programming. EDP-2395.00

The Minicomputer in the Laboratory (Wiley). Operation, programming and applications of PDP-11 computers. EDP-24619.50

GENERAL PROGRAMMING AND APPLICATIONS BOOKS

Assembly Level Programming (Lexington). Good basic book on assembly language programming of small computers.

EDP-23614.95

101 BASIC Computer Games (DEC). A classic. Have fun with your computer. EDP-2377.50

BASIC Software Library, Vol. I. Complete lists of BASIC applications programs book-keeping, games, pictures (graphics). EDP-24024.95

BASIC Software Library, Vol. II. Math, engineering, plotting and statistical programs in BASIC. EDP-24124.95

BASIC Software Library, Vol. III. Advanced business applications programs in BASIC. EDP-24239.95

BASIC Software Library, Vol. IV. Games and business applications programs in BASIC. EDP-2439.95

BASIC Software Library, Vol. V. Games, graphics, and useful math programs in BASIC. EDP-2519.95

ORDER FORM

Agreement

Gentlemen: Please send me the Heathkit Computer Products I have checked below. I understand that if I order products designated for future delivery Heath will do their best to ship within 30 days of those availability dates.

- ☐ H8 Computer at \$375.00 each plus \$5.40 shipping and handling.
- ☐ Qty. _____ H8-1 4K Memory(s) at \$140.00 each plus \$1.15 shipping and handling.
- ☐ Qty. _____ H8-3 4K Chip Set(s) at \$95.00 each plus \$1.15 shipping and handling.
- ☐ H8-2 Parallel Interface at \$150.00 each plus \$1.30 shipping and handling.
- ☐ H8-5 Serial I/O Cassette Interface at \$110.00 plus \$1.15 shipping and handling.
- ☐ H8-13 Extended BASIC Cassette at \$10.00 each plus \$1.15 shipping and handling.
- ☐ H8-14 Extended BASIC on paper tape at \$10.00 each plus \$1.15 shipping and handling.
- ☐ H8-15 Paper Tape Systems Software for H8 at \$20.00 each plus \$1.15 shipping and handling.
- ☐ HM-800 Manual Set at \$25.00 each plus \$2.37 shipping and handling.
- ☐ H11 Computer at \$1295.00 each plus \$5.52 shipping and handling.
- ☐ Qty. _____ H11-1 4K Memory(s) at \$275.00 each plus \$1.15 shipping and handling.
- ☐ H11-2 Parallel Interface at \$95.00 each plus \$1.15 shipping and handling.
- ☐ H11-5 Serial Interface at \$95.00 each plus \$1.15 shipping and handling.
- ☐ Please send the following Computer Books (order must total \$10.00 minimum) postpaid (Print numbers plainly.)

- ☐ H11-6 Extended Arithmetic Chip at \$159 each plus \$1.15 shipping and handling.
- ☐ HM-1100 Manual Set at \$25.00 each plus \$2.50 shipping and handling.
- ☐ H9 Video Terminal at \$530 each plus \$7.64 shipping and handling.
- ☐ H10 Paper Tape Reader/Punch at \$350 each plus \$4.96 shipping and handling.
- ☐ H10-2 Three Rolls Paper Tape at \$10.00 plus \$1.15 shipping and handling.
- ☐ H10-3 Three boxes Fan-fold Paper Tape at \$10.00 plus \$1.15 shipping and handling.
- ☐ H36 DEC Writer II at \$1495 (No COD's, see page 12 for shipping information.)
- ☐ H36-1 Fan-fold Paper at \$30.00 plus \$7.76 shipping and handling.
- ☐ H36-2 E1A Interface at \$65.00 each plus \$1.15 shipping and handling.
- ☐ ECP-3801 Cassette Recorder/Player at \$55.00 each plus \$1.69 shipping and handling.
- ☐ ECP-3802 Cassette Recording Tape, Pkg. of three at \$5.00 plus \$1.15 shipping and handling per pkg.
- ☐ EC-1100 BASIC Programming Course at \$29.95 plus \$1.69 shipping and handling. Available after October.
- ☐ HS-11 Special Priced Complete System at \$3350 each plus \$14.00 shipping and handling.

Note: The H11 and all its accessories will be available November 10th, 1977.

HEATH REVOLVING CHARGE PLAN



You may purchase Heathkit products on our convenient Revolving Charge Plan. No money down and up to two years to pay. Up to \$1500 maximum account balance.

- ☐ I would like to open a Heath Revolving Charge Account. Please rush me the necessary application forms when you receive this order.

I enclose my ☐ check ☐ money order for \$_____ (Michigan residents add 4% sales tax.)

Or charge to my ☐ Visa/BankAmericard ☐ Master Charge

Acc't No. _____ Exp. Date _____

If Master Charge, include Code No. _____

- ☐ Add on to or reopen my existing Heathkit Charge Account. No. _____ (\$1500 maximum account balance.)

Signature _____ (necessary to ship merchandise)

Name _____ Please print plainly

Address _____

City _____ State _____ Zip _____

BR-119 All prices net F.O.B. Benton Harbor, Mi. Prices and specifications subject to change without notice.

HEATH/DEC Software License Agreement:

This form **MUST** accompany your H11 computer order.

CUSTOMER SUBLICENSE GRANT

HEATH COMPANY (hereinafter referred to as HEATH) pursuant to a license agreement with Digital Equipment Corporation (hereinafter referred to as DIGITAL) does hereby grant to CUSTOMER a non-transferable and non-exclusive sublicense to use the Binary Software Program(s) PTSP-11 Paper Tape System, FOCAL/PTS Language Processor, BASIC/PTS Language Processor (hereinafter singularly and/or collectively referred to as "Software") on the following terms and conditions.

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Software is furnished to CUSTOMER for use on a single CPU only and may be modified, or copied (with the inclusion of DIGITAL'S copyright notice) only for use on such CPU. The CUSTOMER shall not provide or otherwise make available the Software or any portion thereof in any form to any third party without the prior approval of DIGITAL. Title to the ownership of the Software shall at all times remain with DIGITAL.

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HEATH COMPANY

By _____

CUSTOMER

By _____

Customer's Signature

Heathkit is the name to look for in quality electronic kits



Heath Company, located on the shores of Lake Michigan near Benton Harbor, is the world's largest manufacturer of electronic kits. Heathkit products are marketed primarily through the Heathkit Mail Order Catalog, published 5 times a year, and a nationwide chain of Heathkit Electronic Centers (Units of Schlumberger Products Corporation).



In addition to this new line of personal computing products, Heath Company offers nearly 400 other electronic kits of virtually every description. Product categories include Amateur Radio, Automotive Accessories, Stereo Hi-fi Components, Test Instruments, Color TV, Boating and Marine Accessories, Leisure and Home Improvement Products, and our award-winning self-instruction programs. Every Heathkit product is supplied with a comprehensive step-by-step instruction manual that tells you all you need to know, from unpacking the kit to plugging it in. These manuals are world-famous for their clarity, accuracy and precision. Let Heath show you how easily you can put together superior quality electronic products. Send for your FREE copy of our latest catalog!

Heathkit Computer Systems are also sold and serviced through 47 Heathkit Electronic Centers nationally (Units of Schlumberger Products Corporation) at slightly higher prices. Check the white pages of your telephone directory for the Heathkit Electronic Center nearest you.

Canadian Customers: Contact the Heathkit Electronic Center in most major cities or write for Canadian Prices to:

Heath Company, A Division of Schlumberger Canada, Ltd.
1480 Dundas Street E.
Mississauga, Ontario L4X 2R7

Toward an Ideal Computer Language

By Jim Levin and
Jim Carlstedt
Associate Editors

Everyone who has written even one computer program has experienced various kinds of frustrations. No matter what the language, there is always something inconvenient with the way that statements must be specified, with the set of primitive statements supplied, with the control structures provided, or with the available ways to store data. We would like to conduct a dialogue here of the things that you would like to see in a language. To avoid the tiresome arguments of which of the existing computer languages is the "best", we will focus the discussion toward aspects that should be part of a new computer language IDEAL. Certainly one way to generate ideas of what

would be good is from shortcomings of existing languages. If the "fixed format" of FORTRAN drives you crazy, then you might suggest "free format" as a requirement for IDEAL.

Given enough good ideas, maybe somebody will actually program IDEAL. However, even without taking the effort to build a new language from scratch, there are several ways you may be able to take advantage of the ideas presented here. You may be able to implement some features within some standard language, or you may be able to build a preprocessor or interface to an existing language.

We welcome any descriptions of features, aspects, or dreams you have for a usable way to communicate with your personal computer.

Extensibility

Extensibility is perhaps the most desirable characteristic of a language, and unfortunately, a characteristic that some of the common languages (BASIC & FORTRAN) lack. Any computer language gives you a set of primitive statements for you to write your programs with. Most languages recognize the importance to defining larger multistatement chunks ("procedures", "subroutines", "functions", etc.) that can be invoked with a single command (BASIC has this "procedural" property only in a very rudimentary way—the GOSUB statement and single line function definitions). Now, a language is extensible when it has a way to define procedures that can be invoked in a way identical to any of the primitives.

Why is this characteristic valuable? Suppose you are unhappy with the set of primitives supplied in the language. Now instead of having to modify the language processor itself, you can just write a set of procedures that perform the actions that you'd like, and use these as basic elements for the programs you want to write. At each level of complexity in program writing, you can think of the lower level procedures as primitive. Especially when combined with an auto-

matic initialization with a user's profile, extensibility gives the user the ability to tailor the programming language to his own needs.

Computing and Editing

Since many computer languages were first invented for batch processing, there has historically been a separation between programming languages and editors. However, with the onset of interactive programming, some of the later languages had built-in editing facilities, so that a programmer could modify his program without leaving the language system. BASIC has some crude editing abilities (add new lines and delete lines); INTERLISP has a more extensive editor. In both these cases, the editor of the language has a different command format, a different set of primitive actions, and a different control structure (often only sequential execution of typed in editing commands) than the language itself.

One criteria of a good programming language is that it can be used to edit programs in the language. Many personal uses of a personal computer require string manipulation capability. Once a computer language has these capabilities, it is not hard to apply them to arbitrary files of text, for example, the text of a computer program. One might ask, does anyone need the full power of a programming language for text editing? Initially, not, but once you start doing extensive editing, then you discover the need to repeat certain actions on a text, the need for conditional actions, and the desirability of defining new editing actions and objects. Not only does the define capability of a language give you the power to personalize the editor to your own needs, but the ability to define classes of text to be operated upon is a powerful way to deal with the complexities of text searches. Designing an ideal programming language so that it can edit its own programs gives the user a super powerful editor that can be used without learning a whole new complex

system.

Library Files

A feature that is very common for compiled language, but largely lacking for interpretive languages is a "library" of previously written programs that can be freely used in your programs, since they are automatically loaded from the library file by the loader program (after being detected by the compiler).

Now, clearly we want our ideal language to have the ability to immediately interpret program statements that we enter. Even given an interpretive language (like BASIC), the interpreter should be constructed so that it scans through library files whenever it encounters a function or procedure that it doesn't know about. In this way, you can build up a workshop full of useful tools that don't cluster up your workspace until you need them.

User Profile

Many users develop a set of procedures that they find generally useful in their programming. In addition, there is often some number of routine statements that have to be issued to any given programming language when starting it up to set memory size, to specify when options are desired, etc. One nice way to avoid wasting time each time the language is invoked is to have a user profile file for the language. This is a file that is automatically loaded by the language processor whenever it is invoked, specifying the routine initialization desired by the user. There are a number of ways to store the information in this user profile, but probably the most powerful way is to store regular ASCII text, which is read by the language program as regular input. With this format, anything that would be interactively as initialization can be automatically read from the user profile file instead. When this feature is present in an "extensible" language, the user can mold the language to his own needs and desires.

SCCS Member Discount Plan

The Board voted to implement the membership discount plan proposed in Gene Murrow's article in the February *Interface*. The following vendors have sent in discount offers, and we hope to hear from more soon.

Vendor	Item	List	Member Price	Delivery* Options
Computer Power and Light 12331 Ventura Blvd. Studio City, CA 91604	Novation acoustic modem	295	236	LA Meeting C,V
	COMPAL-80 16k computer with terminal	2300	2070	
	COMPAL ASR 33 keyboard	165	125	
	Sanyo VM 4092 9" monitor	185	160	
AAAA Computer Hows 1477 Barrington, suite 17 Los Angeles, CA 90025	IMSAI I-8080 (22 slots)	751	638	LA Meeting C,V
	IMSAI boards	10% discount		
	Polymorphic Poly-88 system 2	735	610	
	PolyMorphic boards	10% discount		
	Seals 8K-KSC-z memory	295	265	
Tarbell Electronics 20620 S. Leapwood Ave., suite P Carson, CA	Tarbell Cassette, kit	120	108	LA Meeting C,V
	Tarbell Cassette, assembled	175	157	
The Computer Store 820 Broadway Santa Monica, CA 90401	VTL in ROM for 680 or 8080	114	99	LA Meeting C,V

*C = COD postage, V = pickup at vendors location.

To place your order, send the following form to:
Box 49707
Los Angeles, CA 90049.

Name _____

List date _____

membership number _____

Phone number _____

Address _____

Item

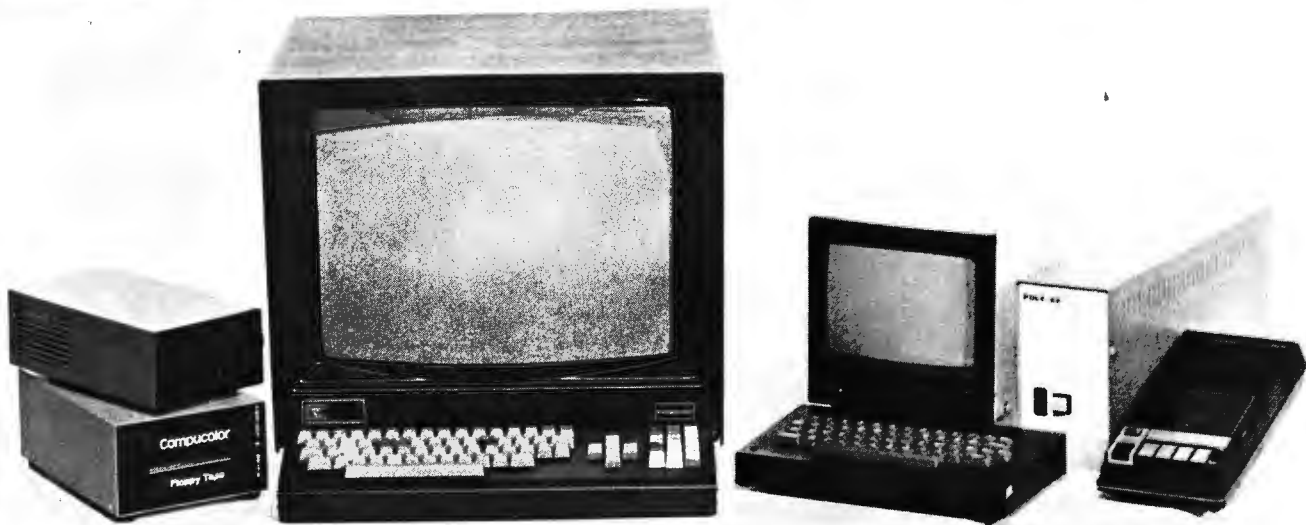
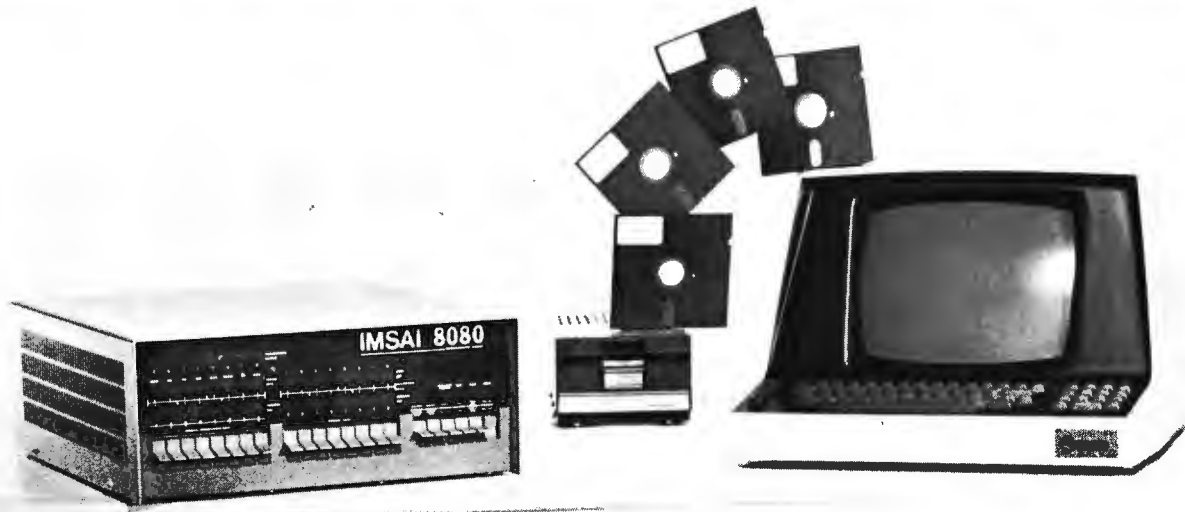
Vendor name

Delivery option

I understand that the terms of this order are COD and that if I am to pick up any items, I shall do so within 30-60 days of publication of this form.

Signed _____

Buy Your Computer Off the Shelf



What you don't see on our shelves here, you'll probably find a few feet away. Our stores are stocked with computers, components, peripherals and supplies from every major manufacturer. If you can't come to us, we'll ship to you . . . anywhere.

At Two Locations:

COMPUTER COMPONENTS
5848 Sepulveda Blvd., Van Nuys, CA 91411 (213) 786-7411
4705 Artesia Blvd., Lawndale, CA 90260 (213) 370-4842

10-9 Tue.-Fri.
Closed Monday
10-6 Sat.-Sun.

Circle No. 61 on Inquiry Card

Benchmarks Aren't Always Marks on Benches

We are presenting this article on benchmarks for several reasons. For those not familiar with the idea of benchmark programs, the article and bibliography will serve as an introduction to the topic. We would also like feedback in getting a standard set of "kernel" benchmarks. Finally, as pointed out in this month's editorial, we wish to begin experimenting with decentralized product evaluation.

This is our first pass at them—a library of benchmark programs—programs which could be run on several systems to compare speed. It is our hope that you will give us feedback on them and that by the next issue or the one following we can have a standard set of benchmarks, which anyone can run on any machine.

In that way, we can decentralize the running of these tests. Anyone who wishes can time benchmark "n" on his machine and send us, or any magazine, the results for publication.

1. Looping speed

This benchmark is important because aside from being of interest in its own right, all of the other benchmarks involve loops and analysis of their speed should include normalization for looping time.

```
10 INPUT M, N
20 FOR I = M TO N
30 NEXT
```

2. Number crunching

```
10 INPUT M, N
20 FOR I = M TO N
30 X = SIN(I)^2 + COS(I)^2
40 NEXT
```

3. Simple arithmetic

```
10 A = 1
20 INPUT M, N
30 FOR I = M TO N
40 X = A + A*A - A/A
50 NEXT
```

4. Evaluation of expressions

```
10 A = 1
20 INPUT M, N
30 FOR I = M TO N
40 X = ((((((A + A) + A) + A) + A)
+ A) + A)
50 NEXT
```

5. Trigonometry only

```
10 INPUT M, N
20 FOR I = M TO N
30 X = SIN(I)
40 NEXT
```

6. Numeric Comparison

```
10 A = 1
20 INPUT M, N
30 FOR I = M TO N
40 IF A = A THEN 50
50 NEXT
```

7. String comparison

```
10 DIM A$(10)
20 A$ = "ABCDEFGHIJ"
30 INPUT M, N
```

```
40 FOR I = M TO N
50 IF A$ = A$ THEN 60
60 NEXT
```

8. Subroutine call

```
10 INPUT M, N
20 FOR I = M TO N
30 GOSUB 1000
40 NEXT
50 STOP
1000 RETURN
```

9. String manipulation

```
10 DIM A$(10), B$(10)
20 A$ = "ABCDEFGHIJ"
25 B$ = "ABCDEFGHIJ"
30 J = 1
40 INPUT M, N
50 FOR I = M TO N
60 FOR K = J TO LEN(A$)
70 A$(K) = B$(K)
80 NEXT
90 NEXT
```

10. Serial file generation

```
10 DIM A$(10)
20 A$ = "ABCDEFGHIJ"
30 OPEN OUT
40 INPUT M, N
50 FOR I = M TO N
60 WRITE #1; I, A$
70 NEXT
80 CLOSE OUT
```

11. Serial File copy

```
10 DIM A$(10)
20 OPEN OUT, IN
30 INPUT M, N
40 FOR I = M, N
50 READ #2; X, A$
60 WRITE #1; X, A$
70 NEXT
80 CLOSE OUT, IN
```

12. Random write

```
10 OPEN OUT
20 DIM A$(10)
30 A$ = "ABCDEFGHIJ"
40 INPUT M, N, G
50 WRITE #1, M; A$
60 WRITE #1, N; A$
70 M = M + G
80 N = M - G
90 IF M <= N THEN 50
100 CLOSE OUT
```


13. Symbol Table Search

This benchmark is to be run with lines 10 and 20 in and with those lines removed. The difference in speed would be attributable to the time required for symbol table lookup.

```
10 A = B + C + D + E + ... + Y
20 A1 = B1 + C1 + D1... + Z1
30 Z = 1
40 INPUT M, N
50 FOR I = M TO N
60 Z = Z
70 NEXT
```

14. Constant conversion

A comparison of 14a and 14b should give an indication of the efficiency with which constants are converted to a form suitable for arithmetic operations.

14a.

```
10 A = 1
20 INPUT M, N
30 FOR I = M TO N
40 A = A
50 NEXT
```

14b.

```
10 INPUT M, N
20 FOR I = M TO N
30 A = 1
40 NEXT
```

15. Random number generator speed

```
10 X = 1
20 INPUT M, N
30 FOR I = M TO N
40 X = RND(0)
50 NEXT
```

16. Random number generator distribution

This benchmark generates 1000 random numbers in the range $0 < X < 10$ and tabulates the number in 10 equally spaced sub ranges (0 to 1, 1 to 2, etc.) Note that the random number generator "seed" is re-initialized 10 times (line 30). When the final array is printed out, a chi-square test can be made for the hypothesis that each sub-interval is equally likely. I've not had time to think about experimental design and would appreciate feedback on this benchmark.*

```
10 DIM A(10)
20 FOR I = 1 TO 10
30 X = RND(-1)
40 FOR J = 1 TO 100
50 K = INT(10*RND(J) + 1)
60 A(K) = A(K) + 1
70 NEXT J
80 NEXT I
90 FOR I = 1 TO 10
100 PRINT A(I)
110 NEXT
```

17. Accuracy

I have no background whatsoever in numerical analysis. The following benchmark could be run, with the value of T/M being a measure of accuracy of computation; however, we need to hear from you numerical analysts on this one.

```
10 INPUT M, N
20 FOR I = 1 TO M
30 IF SIN(I) ^ 2 + COS(I) ^ 2 = 1
   THEN T = T + 1
40 NEXT
50 PRINT T/M
```

These are rough, first cut benchmarks. If you are interested in really getting into the subject, the following

*This is an admittedly crude test. For a rundown on the evaluation and construction of random number generators, see the book "Seminumerical Algorithms" by Donald Knuth, Addison Wesley, 1969. For those who are unfamiliar with Knuth's work, this is the second in a series of books on "The Art of Computer Programming". If you are really serious about learning software and the theoretical foundations of "computer science", set aside a big hunk of time and work your way through these books.

Hardware Used			
computer manufacturer	_____		
model	_____		
clock speed	_____		
Software Used			
interpreter/compiler from	_____		
version	_____		
Results	Benchmark	Inputs	Execution Time
		M	N
	#1	1	30,000 _____ sec.
	#3	1	3,000 _____ sec.
	#4	1	4,000 _____ sec.
	#6	1	15,000 _____ sec.
	#7	1	9,000 _____ sec.
	#8	1	17,000 _____ sec.
	#15	1	6,000 _____ sec.

This is your chance to participate in some decentralized evaluation. Run the indicated benchmarks on as many machines as you wish and send the results and configuration data to Box 5429, Santa Monica, CA 90405 for publication.

bibliography was provided by Warren Erickson, a professor at U.S.C. and an expert in the area of performance evaluation.

Recommended overview tutorial articles:

1. Calingert, Peter, "System Performance Evaluation: Survey and Appraisal", Communication of the ACM, January, 1967.
2. Drummond, M. E., "A Perspective on System Performance Evaluation", IBM Systems Journal #4, 1969.
3. Smith, M. J., "A Review and Comparison of Certain Methods of Computer Performance Evaluation", Computer Bulletin, May 1968.

These will probably require a visit to a College or University library.

More depth

4. Gibson, J. C., "The Gibson Mix", IBM FORM #TR002043.
5. National Bureau of Standards, "Benchmarking and Workload Definition #405" (\$1.05) and "Guidelines for Benchmarking the ADP System in Competitive Procurement Environments", FIPS publications #42 (\$.45).

Both of these are available from the Superintendent of Documents, US Government Printing Office, Washington D.C., 20402.

6. The Association for Computing Machinery has a special interest group in performance evaluation, called SIGMETRICS. They publish a quarterly called "Performance Evaluation Review". Write: Phil Kiviat, Dept. of the Air Force, FEDSIM/CA, Washington D.C., 20330 for information.

Hobby Machines

7. Rugg, Tom and Feldman, Phil, BASIC Timing Comparisons, Kilo-baud #6.
8. Martin, Bob, "Need a Better Random Number Generator?", Interface Age, February, 1977.

New Products

680b BASIC

Circle number 10 on Fast Feedback card

Altair 680b BASIC, Version 1.2 has been developed for use with the KCACR cassette interface. Available on audio cassette, it includes the standard functions and operations of 680b BASIC in addition to the capability of storing and loading software through the 680b KCACR. MITS 2450 Alamo S. E., Albuquerque, NM 87106.

Interfacing Selectrics

Circle number 11 on Fast Feedback card

Explore the use of a Selectric as a microcomputer terminal for application areas as word processing, correspondence, newsletter composing and information retrieval. Electronic interface kits available for output only. Standard ASCII serial RS-232C input. Includes fourteen solenoid drivers for 24 volts—you provide the solenoids and mechanism. Only \$325 in kit form w/o power supply. Power supply versions available. Shipment four weeks ARO. Manual only for \$12. Send SASE for brochure to Center For the Study of the Future, 4110 N. E. Alameda, Portland, OR 97212.

COSMAC Hand Held Terminal Manual

Circle number 15 on Fast Feedback card

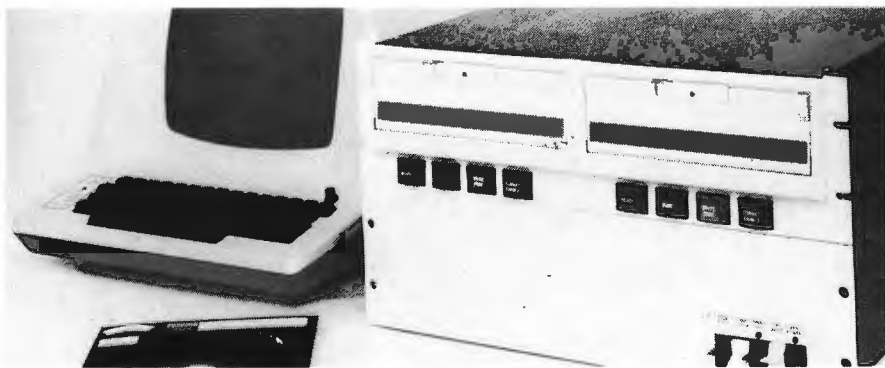
A 28-page Instruction Manual for the RCA COSMAC Microterminal CDP18S021, MPM-212, describing the installation and application of a hand-held data terminal for microcomputer systems using the CDP1802 microprocessor, is now available from RCA Solid State.

The Microterminal, the size and shape of a pocket calculator, is a low-cost, low-power, small-size non-hard-copy alternative to a conventional data terminal such as the teletypewriter. Together with its associated ROM, the Microterminal provides a means of controlling a COSMAC-based system and supplies hexadecimal I/O capability. It is designed to interface directly with the COSMAC Evaluation Kit CDP18S020 support hardware, but it can be readily designed into user-built systems to provide the same control, communications, and debugging functions.

The Manual includes a description of the hardware and the software programs available in the ROM supplied with the Microterminal and also includes installation instructions and utility program listings. The operating modes of the Microterminal are described along with several examples of operating sequences.

\$2.00. RCA Solid State Division, Box 3200, Somerville, New Jersey 08876.

Sounds interesting! Anyone want to review it for us?
—Larry



Turnkey LSI-11

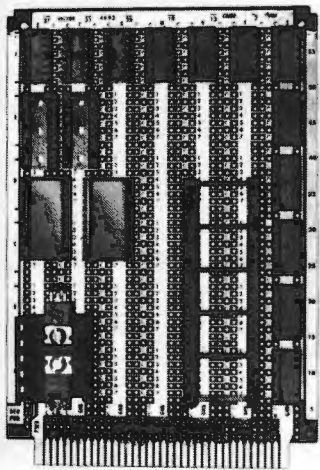
Circle number 14 on Fast Feedback card

Andromeda Systems is now delivering a powerful, but compact, computer system based on the DEC LSI-11 CPU. The system, designated the 11/B, features dual floppy disks, floating point arithmetic firmware, 20K 16 bit words of memory, a 9600 baud video terminal, and DEC RT-11 operating software.

The entire package, exclusive of the terminal, is contained in a 10.5" high,

rack mountable chassis. The CPU, serial interface, floppy disk controller, and memory only require three slots of the eight-slot card cage; leaving 5 slots for additional memory and peripheral interfaces.

The 11/B is available with stock to 30-day delivery for \$8317.00. The FDC-11 floppy disk controller is also available stock to 30 days at \$850.00. Personality cards for the PERTEC floppy disk drives are \$50.00 each. 14701 Arminta Street #J Panorama City, CA 91402.



Real Estate

Circle number 1 on Fast Feedback card

Four new high-DIP-capacity circuit cards, from Vector Electronic Company, provide a combination of board sizes, convenient power-bus and ground-plane organization and edge connector configurations that speed development of virtually any microprocessor cpu, memory, or interface system. Unlike other cards with restrictive bus patterns, the new Vectorcards accept all DIP sockets with 0.1 inch by 0.3-, 0.4-, 0.6-, and 0.9-inch lead spacing, and with up to 64 pins.

A full ground plane is provided on the component side and a power plane is provided on the wiring side. The plane configuration places power supply conductors less than one quarter inch from any DIP lead, and aids in heat dissipation. The planes exhibit a minimum of 430 pf distributed capacitance for low characteristic impedance on the 6.5 inch long card.

The 4493 and 4493-1 have 72 edge contacts (36 per side) on 0.1 inch spacing while the 4494 and 4494-1 have 44 contacts (22 per side) on 0.156 inch spacing.

\$14.95-16.95. 12460 Gladstone Avenue, Sylmar, CA 91342.

Hobby Index

Circle number 5 on Fast Feedback card

The *Periodical Guide for Computerists* is a 20 page book that indexes over 1,000 personal computing articles from 15 magazines for January-December 1976. The articles are indexed under more than 100 subject categories. Articles, letters from readers, book reviews and editorials from both hobbyist and professional publications are indexed.

The guide is available from: E. Berg Publications, 1360 S. W. 199th Ct., Aloha, Oregon 97005 for \$2.50 each postpaid and also from local computer stores.

Z80-A with 4 MHz Clock Rate

Circle number 12 on Fast Feedback card

Zilog, Inc., has begun production of the Z80A microprocessor CPU circuit with a standard clock rate of 4.0 MHz. The Z80A is both pin- and software-compatible with the company's Z80 CPU chip, a 2.5 MHz device.

The Z80A, with an instruction cycle time of 1.0 microseconds, is capable of increasing systems throughput by 60 per cent over Z80-based systems. The new, single-chip N/MOS silicon-gate CPU is rated at ± 5 volts (VAC or VDC) over an operating temperature range of 0 degrees C to 70 degrees C. Main power supply current is typically 90 milliamps.

In ceramic 40-pin dual-in-line packages, the Z80A is priced at \$65 for 1-to-24 quantities.

Delivery is 30 days ARO. Zilog, 10460 Bubb Road, Cupertino, CA 95014.

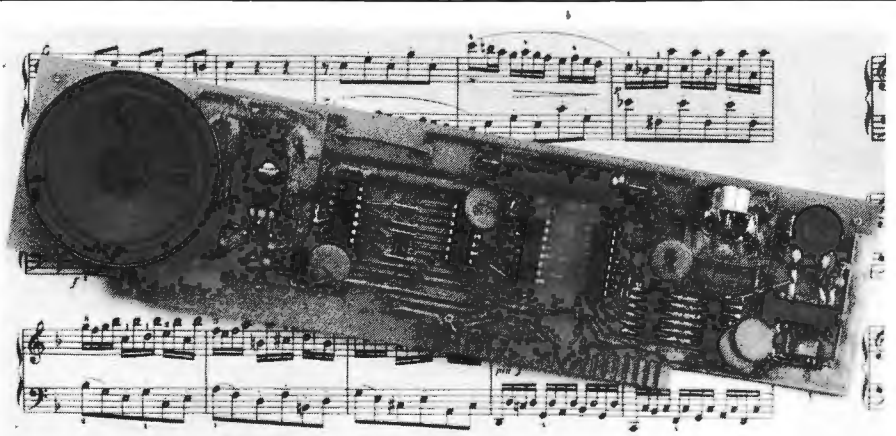
BASIC-E Manual

Circle number 23 on Fast Feedback card

CP/M is a disk operating system furnished with IMSAI and DIGITAL SYSTEMS floppies. It is undoubtedly the most satisfactory file management system now available for micro-processor owners.

CP/M owners are presently using BASIC-E—a compiling language written by Gordon Eubanks—which provides disk random-access capability. There are several BASIC-E versions floating around, with decreasing bugs in more recent editions. A major problem for users has been the lack of adequate documentation.

JEM Company has produced a comprehensive BASIC-E manual, which explains, in detail, how to program in BASIC-E and how to exploit the capabilities which BASIC-E provides. \$15.00. JEM Company, 2555 Leavenworth Street, San Francisco, CA 94133.



Economical S-100 Music Board

Circle number 22 on Fast Feedback card

This low-cost Model 6 Music Board enables anyone with an S-100 bus computer to produce music and sound effects. Applications include generating melodies, rhythms, sound effects, Morse code, touch-tone synthesis, and much more.

Its features include selectable output port address decoding, a latched 6-bit digital-to-analog converter, audio amplifier, speaker, volume control and RCA

phone jack for convenient connection to your home audio system. It employs a glass epoxy printed circuit board with plated-through holes, gold-plated fingers and top quality components.

A complete Users Manual, supplied with the Model 6 Music Board, includes a BASIC Language program for writing musical scores and an 8080 Assembly Language routine for playing them.

\$59.95 assembled and tested. Newtech Computer Systems, Inc., 131 Joralemon Street, Brooklyn, New York 11201; (212) 625-6220.

16K EPROM Memory Board Kit

Circle number 13 on Fast Feedback card

Designed to plug into the popular S-100 bus, the memory board holds 16 2708 EPROMs. Unused 4K sections can be disabled to allow RAM to exist within the board's address space. The board

also has provisions for a wait state to allow it to run on a Z80 system. The Kit comes complete with sockets for all IC's. (Less EPROMs) Quantity discounts and dealer prices are available. Contact factory, \$85.00. IBEX, 1010 Morse Avenue, Suite 5, Sunnyvale, CA 94086.



Family of Z-80 Based Boards from Zilog

Circle number 3 on Fast Feedback card

Zilog, Inc. has introduced a family of Z80-based microcomputer boards to offer users a modular approach for building their own computing and processing systems. Each of the boards is bus-compatible and directly interfaces with all others in the series. All boards currently offered are available for delivery 30 days ARO.

Leading off the series is the Z80-MCB

Microcomputer Board, designed to operate as a single-board computer, including its own self-contained memory, plus serial and parallel I/O ports. The Z80-MCB has capacity of 4K bytes of dynamic RAM, plus up to 4K bytes of EPROM, PROM, or masked ROM.

The family also includes memory boards, a video display, a dish controller, and I/O boards. The Z80-MCB is \$495 in unit quantities. Zilog, 10460 Bubb Rd., Cupertino, CA 95014.

8080 Fortran IV Compiler

Circle number 4 on Fast Feedback card

Microsoft, an Albuquerque based software development firm, has announced the availability of a FORTRAN IV compiler for the 8080 microcomputer. Called FORTRAN-80, the initial release of this compiler is a full implementation of ANSI Standard Fortran with the exception of the double precision and complex data types.

The compiler generates pure, relocatable code (may be placed in ROM), and the runtime package may also be placed in ROM. The one-pass compiler requires less than 12K bytes of memory, and the runtime system less than 6K bytes.

A relocating linking loader is included with the FORTRAN package. Therefore, subprograms may be compiled separately and linked at load time. This also means that only the specific subprograms required are loaded (including system subprograms).

Another part of the package is a relocating assembler and an assembly language debugging program. The assembler may be used to produce FORTRAN compatible subprograms. The debugging system may be used with the load map produced by the loader to debug FORTRAN and/or assembly language programs.

Individual copies of FORTRAN-80 may be purchased for \$500 including documentation. Manual \$15. OEM licenses available. 819 Two Park Central Tower, Albuquerque, NM 87108.

Centronics Printer

Circle number 21 on Fast Feedback card

This 240 character-per-second Printer is offered as a complete unit including case, power supply, 96 character ASCII generator and interface, paper roll holder, low paper detector, bell, and multi-line asynchronous input buffer.

It produces copy on aluminum coated paper by discharging an electric arc to penetrate the coating, which is less than one micron thick. Toners and ribbons are not required.

The printed characters, unlike those resulting from thermal printing, are impervious to light, temperature, and humidity. In addition, the finished printed paper may be reproduced on any office copying machine. It can produce copy at a rate of 180 lines per minute on 4 3/4 inch roll paper and provides the user software selection of 20, 40, or 80 columns. Initial deliveries are slated to occur during the last calendar quarter of 1977. \$595. Centronics, Hudson, NH 03051.



Music

Circle number 23 on Fast Feedback card

The Solid State Music Synthesizer Board (SB-1) is a waveform synthesizer card designed to interface with the S-100 bus. With this card, a microcomputer may be programmed to play a monophonic solo in an instrumental "voice" that is controlled by software. Polyphonic capability is provided for an MUX for multiple cards. The music is written by the user by means of high-level language (interpreter), called MUX which is entered into the system via an ASCII keyboard, paper tape, floppy or other input medium.

Kit \$250, assembled \$350 (sockets and software included). Solid State Music, 2102A Walsh Ave., Santa Clara, CA 95050.



Text Editor

Circle number 19 on Fast Feedback card

EDIT/8080 is an interactive text editor that provides the capability to create and manipulate ASCII text material. Text is partitioned into variable length lines that are contained in an internal edit buffer. The contents of the buffer may be saved at any time for later re-use. Special facilities allow for the construction of "editing algorithms" by combining individual commands together into "command groups". Program \$50, manual \$7.50. Hobbysoft, Box 17066, Irvine, CA 92713.

Professional DOS for 8080/780

Circle number 24 on Fast Feedback card

CP/M is a low-cost advanced disk operating system designed for use with IBM-compatible diskette-based computer system which employ the Intel 8080 microcomputer. Previously available only to OEM's, CP/M has been in existence for over three years in various manufacturers' products and has undergone extensive field testing. The functions of this software package include named dynamic files, program editing, assembly, debugging, batch processing, and instantaneous program loading, resulting in facilities similar to popular time-sharing services. CP/M is an "unbundled" software package which can be easily adapted to any 8080 or Z-80 computer system with at least 16K of main memory and one or two IBM-compatible disk drives.

CP/M System in object form with documentation is \$70, documentation (set of 6 manuals) alone is \$25. Digital Research, P.O. Box 579, Pacific Grove, CA 93950; (408) 373-3403.

CRT/Mainframe

Circle number 6 on Fast Feedback card

Computer Data Systems has announced the availability of The Versatile CRT, their new product which now makes it possible for hobbyists and businesses to individually select software and components that are S-100 bus compatible. Assembled and tested at the factory, The Versatile CRT consists of a commercial 9" video monitor, ASR 33-type ASCII keyboard, and fully powered main-

frame. All components are enclosed in a unified, rugged, lightweight cabinet.

The mainframe includes a card rack with space for ten S-100 bus cards, a mother board with room for ten 100-pin Altair/IMSAI compatible edge connectors with power rated at 20 amps dc, and a fan. Add your own CPU, video board, memory and peripherals and you're up and running.

\$699.95. Computer Data Systems, English Village, Atrium #3, Newark, DE 19711.

Professional Software

Circle number 9 on Fast Feedback card

Quadrant Inc. has a line of business applications software for the Altair. Samples from their catalog of 35 packages are: a total accounting system (payables, receivables and general ledger) \$5,000; inventory management, \$2,000; clinical billing, \$2,500; PERT, \$900.

647 W. 17th Avenue, Longmont, CO 80501.

8080 Debugging Monitor

Circle number 20 on Fast Feedback card

The MOS/8080 micro operating system is a powerful debug package for the 8080 microprocessor. It provides an extensive set of commands and features to control the execution of 8080 programs. These significantly reduce the time and cost involved in program check-out.

Communication with MOS/8080 is via an interactive monitor. This accepts symbolic commands entered through a terminal device. Over 15 separate commands are provided. Program \$50, manual \$7.50. Hobbysoft, Box 17066, Irvine, CA 92713.

Ready to Use Floppy Disk System for S-100 Micros

Circle number 25 on Fast Feedback card

Synthetic Designs FDS-2 complete disk system includes dual floppy drives, controller, interface, power supplies, cabinet, and software. Utilizing iCOM's sturdy and proven IBM compatible Frugal Floppy™ system together with their excellent Executive system, Text Editor, and Assembler, the FDS-2 features a stylish cabinet and an exclusive "Executive Handler".

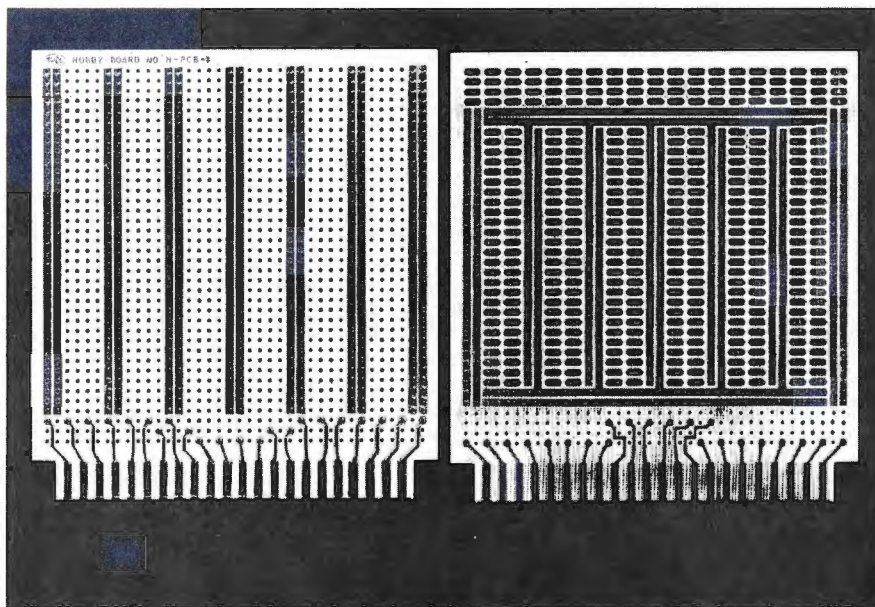
Delivery is stock to two week with OEM and dealer discounts available, assembled \$2690. Synthetic Design Company, POB 2627, Pomona, CA 91766; (714) 629-1974.

SWTP Boards

Circle number 7 on Fast Feedback card

GIMIX Inc. has a line of boards for the SWTP bus. An 8K PROM board (\$119), a 16 x 32 or 16 x 64 (if monitor bandwidth is 10 MHz) video board (\$249) and an extender board (\$25).

1337 W. 37th Place, Chicago, IL 60609.



Universal PC Board

Circle number 16 on Fast Feedback card

Model H-PCB-1 is the first in a new series of top quality PC Boards for the serious amateur. The 4 x 4.5 x 1/16 inch board is made of glass coated EPOXY Laminate and features solder coated 1 oz. copper pads. In addition, the board has a 22/22 two sided edge connector, with contacts on standard .156 spacing. Edge contacts are non-dedicated for maximum flexibility.

The board contains a matrix of .040 in. diameter holes on .100 inch centers. The component side contains 76 two-hole

pads that can accommodate any DIP size from 6-40 pins, as well as discrete components. Typical density is 18 of 14-Pin or 16 Pin DIP's.

Two independent bus systems are provided for voltage and ground on both sides of the board. In addition, the component side contains 14 individual buses running the full length of the board for complete wiring flexibility. These buses can also serve to augment the voltage or ground buses, and may be cut to length for particular applications.

\$4.99. O.K. Machine and Tool Corporation, 3455 Conner Street, Bronx, NY 10475.

Workshops by Bugbook Authors

Circle number 18 on Fast Feedback card

Microcomputer Interfacing Workshop, September 15, 16, 17, 1977.

A three-day workshop based on the popular 8080 microprocessor. Over 20 operating 8080 computers are available for participant use.

Digital Electronics for Automation Workshop, September 13, 14, 1977.

A two-day workshop based on the small scale and medium scale TTL integrated circuits. Many hours of laboratory time with individual breadboarding stations will be provided along with indepth lectures. These sessions will be held at the V.P.I. and S.U. Extension Center in Reston, Va. (Dullas Airport). For more information on these workshops contact Dr. Norris Bell, V.P.I. and S.U., Blacksburg, Virginia 24061, (703) 951-6328.

680 b Cassette Interface

Circle number 2 on Fast Feedback card

MITS announced the 680b-KCACR cassette interface. The KCACR circuitry is based on the Kansas City Standard, making data transfers highly reliable without any component adjustments and under widely varying conditions.

Other design features include a digital demodulator, CMOS logic allowing low power consumption, a motor control circuit for starting and stopping tape motion and the use of test points at key circuit areas. All ICs are socketed. A complete set of documentation containing diagnostic software, test point waveforms, theory of operation and a detailed operator's section is also provided.

\$188.00 assembled, not available as a kit. MITS, 2450 Alamo, S. E., Albuquerque, NM, 87106.

Expandable 6502 Tutorial System

Circle number 22 on Fast Feedback card

CGRS Microtech has a highly modular system which may start as small as a one-board 6502 (\$84.95 kit or \$109.95 assembled) and grow to a three board system with a hex front panel and 7 slot, S-100 motherboard (\$299.95 or \$389.95). This system is for the hobbyist who wants to learn hardware, not just use it.

CGRS Microtech, Box 368, Southampton, PA 18966.

Line-by-line Resident Assembler for SC/MP

Circle number 17 on Fast Feedback card

National Semiconductor Corporation is now offering a line by line resident assembler firmware kit, designed for use with its SC/MP LCDS (Low Cost Development System). Known as SUPAK, the assembler is contained in eight PROM/ROM devices that can be plugged into a blank ROM/PROM card which is available from National. The entire assembled card is then inserted into the LCDS/teletype system.

The line by line assembler accepts a program in limited assembly language from a keyboard or paper reader, and then assembles it directly into RAM. The paper tape line editor, allows insertion, deletion or replacement of lines of program source code, and punches either leader or trailer.

\$3.00. 2900 Semiconductor Drive, Santa Clara, California 95051.

BASIC in ROM from Ohio Scientific

Circle number 25 on Fast Feedback card

Ohio Scientific's new Model 500 CPU board can be used as a stand-alone computer or as the CPU in a larger system. The board accepts 8K of ROM, 4K of RAM, 750 bytes of PROM, an ACIA based serial port, a 6502 processor, and full buffering for expansion!

The Model 500 is available completely assembled with 8K BASIC in ROM for only \$298.00. By simply adding a terminal and power supply, the user has a complete system which will accept up to 200 lines of BASIC program without expansion.

The Model 500 is software and hardware compatible with Ohio Scientific's 400 kits and Challenger products, thus, allowing expansion to a large system.

The board is available enclosed with power supply as the Model 500-1 (\$429) and is available in an eight slot Challenger case as the Model 500-8 (\$629). Ohio Scientific, Hiram, Ohio 44234.

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28	Standard P C Tin	80
28	Wire Wrap Tin	95
40	Lo Pro (Open Frame) Tin	50
40	Wire Wrap Tin	1.55

Games and Things ...

By Phil Feldman and Tom Rugg,
Associate Editors

Some random notes that may be of interest to the computer game-playing readership:

BOOKS

We are sometimes asked about our recommendations on books for computer gamers. Some of these books have actual program listings, while others provide ideas about how to write your own computer games. You can find most of these in computer stores, or through mail-order ads in the hobby computing magazines. Here's the way we see some of them:

101 BASIC Computer Games, by Digital Equipment Corp. (1975)

If your main concern is getting hold of a bunch of games to put up on your system, this is probably your best source. It was edited by David Ahl, of *Creative Computing*. Amazingly enough, there actually are 101 games in it—108 if you count different versions of the same game. All are written in various versions of DEC BASIC, so you'll need to do a little conversion on most of them (a lot on some) to get them to run in Altair BASIC, or whatever you may have. All the programs have brief explanations of how they work, and almost all have sample runs with them. Some

are very simple games, and some aren't really games at all. And some are a lot more complex—Space War (Star Trek), Stock Market, Hamurabi, Can-Am. For even the casual computer game player, this is a must-have book.

What To Do After You Hit Return or P.C.C.'s First Book of Games, by People's Computer Company (1975)

This is also an excellent book, although there are only 48 games in it. The most frustrating thing about it is that eight of them don't have program listings. Also, there's some duplication with *101 BASIC Computer Games*. But you still have to get this one. Their choice of games is excellent—all are very people-oriented. It's written with humor and affection. Even if you aren't a fan of computer games (do such people really exist?), you'll find this book fascinating. All programs are written in HP (Hewlett-Packard) BASIC. Buy it and you're getting a fine book and supporting P.C.C. to boot.

Problems for Computer Solution, by Fred Gruenberger and George Jaffray (John Wiley & Sons, 1965)

That's right, this book was published in 1965. Twelve years old and we still think it's the best book you can get if you want to come up with interesting things to do with your computer. Although many of the problems and examples refer to the IBM 1620 computer, the techniques, algorithms, and principles that are presented will generally work on any computer.

Although meant to be used by a student who has completed an introductory course in computing, we feel most hobbyists who have been experimenting with their own machines will get just as much out of it—probably more. If you can find a book that has more tips, interesting applications, sound advice, methods, and overall value, let us know. We don't think you will. The introduction alone is worth the price of the book.

This book doesn't give you all the answers, but it shows you how to come up with the answers yourself, and how to tell the difference between good and not-so-good approaches to solving problems.

Game Playing With Computers, by Donald D. Spencer (Hayden, Second Edition, 1975)

This one is hard-bound, expensive, and a disappointment. We reviewed it in the December, 1976, issue of *SCCS Interface*. Its main problems are that it has very few interesting program listings, very little discussion of strategy or adapting games to computers, and it tells you more than you could possibly ever want to know about magic squares. In its favor, it has a good bibliography, and it gives the rules of a lot of games you might want to try to program yourself. It doesn't provide many clues on how to do it, though.

Chess and Computers, by David Levy (Computer Science Press, 1976)

This is basically a survey of the history and current state of chess playing programs. If you're at least moderately interested in both chess and computers, you should like this. Many games between programs and humans (and other programs) are shown. It also gives some details about the way chess playing programs work. Not so much that it's boring, but enough to give an appreciation of what's involved. The author is a British programmer and International Master of chess. He's best known as the director of an annual computer chess tournament and as the man who bet in 1968 that no computer chess program would be able to beat him within the next ten years. The time limit is up in August of 1978, but his opponents just recently conceded the bet to him after a match a few months ago. If you're toying with the idea of writing a chess program on your micro system (or any system), be sure to read this first.

Board And Table Games From Many Civilizations, by R. C. Bell (Oxford University Press, 1969)

There's absolutely no mention of computers in this book, but it has a lot of interesting games explained that you might want to try to program for yourself. You'll probably have to look in a large bookstore to find this one, but it's worth it if you enjoy unusual games.

CHESS CHALLENGER

Speaking of computer chess, somebody has finally put together a microprocessor-based package for the general public that is strictly a chess-playing machine. We've seen it (the "Challenger") at Chess and Games Unlimited, on Pico Blvd., in West Los Angeles.

For two hundred dollars, you can get one, consisting of a surprisingly small box with a chess board on the left and a little keyboard and display on the right, from which you enter your moves and read the computer's moves. It's strictly a "static" evaluator in deciding what moves to make. That is, it doesn't "look ahead" to see what future moves might be made as a result of its move. As a result, it looks like it might play an absolute beginner pretty evenly, but it plays pretty badly against a human player with any experience.*

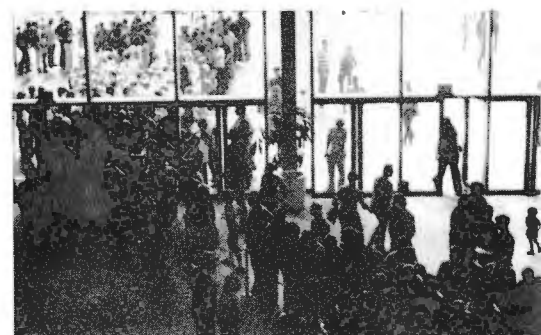
According to the documentation (which doesn't give any technical details), you can send to the manufacturer to get an "undate" that will play a stronger game. That's another \$75, though. All in all, it seems to us that this sort of thing is going to look pretty crude in a couple of years, when fully packaged systems will probably be available for not much more cost, and they'll do a lot of things besides playing chess. In any event, The Challenger, along with the Fairchild system that has been available in department stores for several months, seem to be the first real steps in "home computers for the masses". Is the Commodore Pet the next big step? Time will tell.

*Bobby Fisher made the same comment in Doug Penrod's Computer Chess newsletter. ed.



Left, Captain Kirk (William Shatner) reminiscing before thousands of Trekkies at a recent Star Trek convention in Los Angeles.

Below, Trekkies waiting to get into the convention.



STAR TREK

Because there seem to be a lot of computer gaming people who are also Star Trek fanatics (and because we have an inside source), we were telling you over a year ago about the new Star Trek feature movie that was going to begin filming "in a few months". You probably noticed that it never happened. There were several delays, generally brought about by the inability of the studio (Paramount) and the producer to agree on a script.

They finally decided to forget the movie and bring back the television series instead (*Star Wars* may have had something to do with the decision). All the details haven't been agreed to yet (and there's always the chance the whole thing will fall through again), but the plan is to get the filming started this fall, and begin showing the 22 episodes that are planned in spring of next year. At the moment, they're negotiating with the cast and assembling the technical crew. Jim Rugg seems to be the name of the special effects man, but that's probably just a coincidence. By the time you read this, they should be designing (and maybe building) the sets for the Enterprise.

The two big questions of the moment are, will the two big name stars be back (William Shatner and Leonard Nimoy), and will they use any microprocessors for any of their visual effects? Let us know if you're interested in the answers. Let us know if you're interested in more coverage of the Star Trek world in general.



Harlan Ellison, prolific science fiction writer and entertained and informed the Trekkies.

Photos by Larry Press

Pascal Users Group

Do you know what Pascal is? It's a programming language (no, BASIC isn't the only one). You should get familiar with Pascal if you're not already, since its control structures and data types lend themselves to writing clear, well-styled programs.

The Pascal user's group has 1087 members in 31 countries and 47 states. They publish an excellent quarterly which combines the open format of the old Micro-8 Newsletter with serious content. The May issue had 68 dense pages and a number of references to micro based activity.

Membership is open to anyone: particularly the Pascal user, teacher, maintainer, implementor, distributor, or just plain fan. Institutional memberships, especially libraries, are encouraged. Membership is per academic year ending June 30. Anyone

joining for a particular year will receive all 4 quarterly issues of *Pascal Newsletter* for that year. (In other words, back issues are sent automatically.) *First time members* receive a receipt for membership; *renewers* do not to save postage.

Cost of membership per academic year is \$4 and may be sent to: Pascal User's Group %Andy Mickel, University Computer Center, 227 Exp Engr, University of Minnesota, Minneapolis, MN 55455; •(612) 376-7290.

Sphere Users Group Lives On

We received a large package of material from Programma Consultants, 3400 Wilshire Blvd., Los Angeles, CA 90010, regarding the bankruptcy of Sphere and Programma's effort to support current Sphere "orphans".

They confirmed that *Sphere* is in

Chapter 11 and roughly \$600,000 in debt with only about \$100,000 current assets. Furthermore, under the laws of Utah, customers with prepaid orders pending (about \$90,000) will be repaid last, and a tentative buy-out by EDO Western has fallen through.

Programma, an ex-distributor for Sphere, intends to try to continue support of Sphere users by publishing a newsletter (\$12 for 6 issues), distributing software (a growing library is available) and trying to obtain hardware from the inventories of Sphere and their ex-suppliers.

Sphere's bankruptcy serves as a reminder of the fact that we are in a very volatile market with relatively low entry cost for a supplier, particularly if he follows the all too common practice of capitalizing his enterprise with prepaid orders. The bright side is that there are many M6800 users besides Sphere, so those who did get their systems aren't left *totally* out in the cold.

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Helpful Hints, or What I Had To Learn To Build a Computer

The Electronic Connection

By Tricia Wood, Associate Editor

Hello, last time I talked about reading data sheets, schematics and logic diagrams. I hope you enjoyed reading it. There is an error though, in Table 2, the SPDT switch symbol should be:



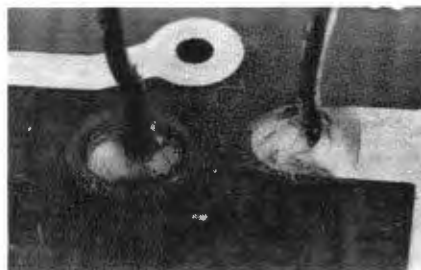
This time I will cover soldering and wire wrap equipment and techniques. Soldering and wire wrap are two common techniques by which electrical connections can be made between two conductors.

Soldering is used when a rather permanent connection is desired. It is used in production when a lot of the same connections are being made. This is also the most popular type of connection made by home computer hobbyists.

A hot soldering tool, solder and flux are the basic supplies one needs to make a solder connection. There are various soldering tools on the

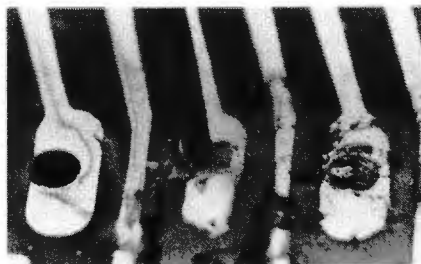
market nowadays. Some examples are soldering irons (which can have controlled or uncontrolled heat) and soldering guns. The guns have the advantage of a quick heat up time as opposed to irons which have a relatively slow heat up time. Though it might seem that the guns are more convenient, they get quite hot; sometimes too hot for use on small components. Irons come in a variety of wattages, each of which produces a different temperature. I use a 42 watt iron, but a smaller wattage is recommended for the beginner.

Solder is a metallic substance (looking like wire) composed of lead and tin. Usually it has 60% tin and 40% lead. Flux is used to conduct heat to the parts to be soldered and to clean them. Flux can be applied separately before the solder, or the solder can be made with the flux incorporated into it. The latter is very convenient for obvious reasons.



Good solder joints take a lot of practice to achieve. There are three basic steps to get one like that in figure 1:

- 1) Heat the part for about 3 seconds.
- 2) Apply solder to the heated part, not the iron.
- 3) Let part cool without disturbing it for about 10 seconds.



The joints in figure 2 aren't too good.

In fact, I doubt that there is a connection. There is carbonized flux, indicating that too much heat was used, and the solder didn't "flow" as in the joints of figure 1. This is because the part wasn't clean before soldering. It is corroded. You can use a typing eraser or sandpaper to remove the corrosion.

A wire wrap joint is made by tightly wrapping a bare connector around a rectangular post. The post has sharp edges which cut into the wire as it is wrapped. In a properly made joint, the pressure at the edges of the post is high enough to cause a cold weld to take place. For every turn, 4 welds are made. One uses the wire wrap technique for rather temporary connections or "one of a kind" circuits (prototypes).

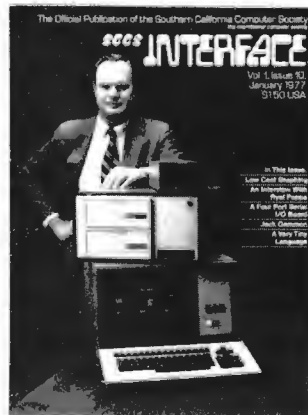
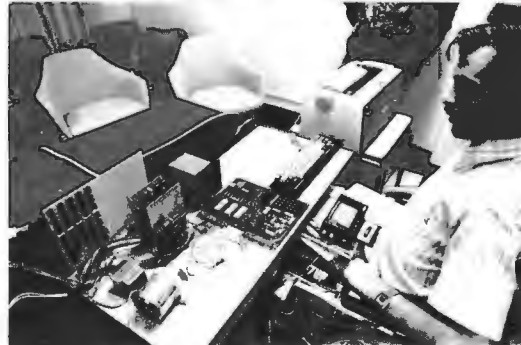
The tools involved here are a wire wrap gun (electric or manual) and 30 gauge wire. The tip of the gun has 2 holes, one small and one large. Connections are made easily:

- 1) Strip wire about 1" from end.
- 2) Put the wire in the small, uncentered hole of gun.
- 3) Place the large hole of the gun over the post to be wrapped.
- 4) Press trigger and before releasing, remove from the post.

Both solder and wire wrap joints can be removed. There are various desoldering tools on the market. They range from heated suction devices to wire braid. I prefer the wire braid since it is inexpensive and easy to use. The solder is essentially sucked up into the braid as it is heated. There is also a little tool to undo wire wraps. You put it over the post and twist it; it hooks the wire and unwraps it.

This is merely an outline of what is involved in making a connection. I welcome any questions you might have, and would strongly suggest you practice making some connections. I won't give further references because I feel that you should try it, not read about it. Get help from a nearby, friendly club member.

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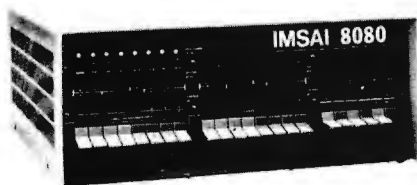
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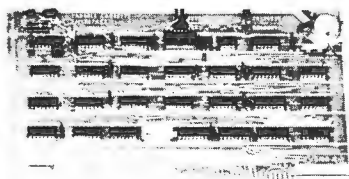
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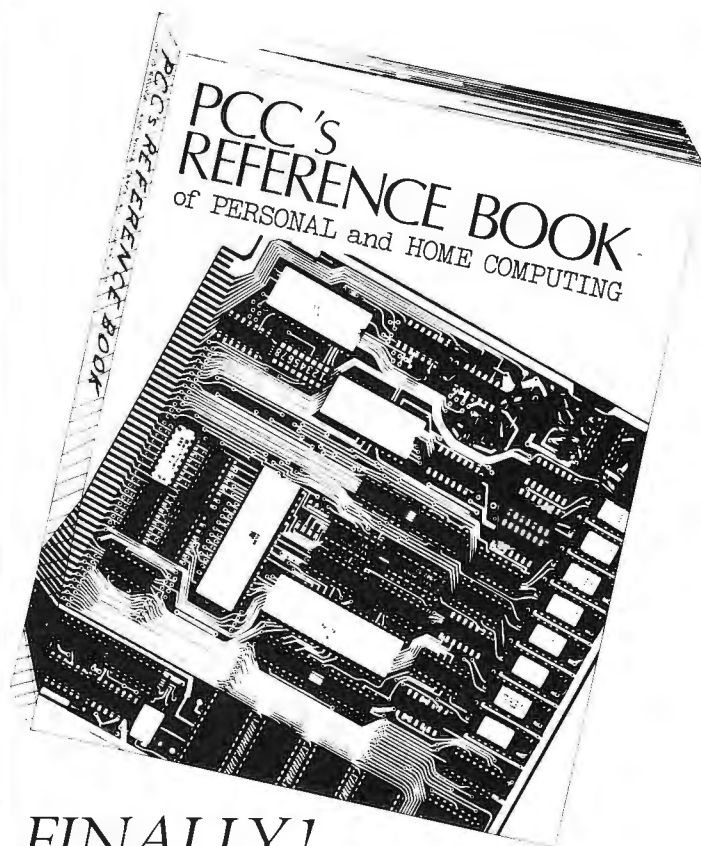
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SCCS

Reviews, Pointers 'n' Such

Ron Carlson, Editor

Starting this issue we'll start a cumulative bibliography for various areas of interest. Included are books, magazines, journals, articles, tech papers, thesis, and biblios. This will allow us to see what's available rather than a tiny sampling. Suggested entries should be sent to the review editor with a short review. We'll print reviews of special or exceptional entries and recommend all those worthy by inclusion into the listing. Please send in any material you think useful.

I settled on a rating code for the dozens of books I get every week or so such that they can be listed, rated and selected with a minimum of space. A book like Knuth's **Fundamental Algorithms** would be listed with a rating of BMSCTH.

CONTENT:

Beginner	B
Moderate	M
Advanced	A

BITS/BUCK

O.K.	O
Good	G
Excellent	E
Steep, but good	S

USEFULNESS

Classic	C
Text level	T
Handy	H

Construction, Troubleshooting

- K1) **Handbook for Electronic Assembly and Fabrication** Hexacon Electric Co. 161 Clay Ave. Roselle Park, N.J. 07204, 42pgs BMETH
- K2) **Techniques of Digital Troubleshooting** (Applic. Note 163-1) Hewlett Packard 1973 28pgs BGTH

Historical

- Z1) **A Computer Perspective** C. Eames, R. Eames 1973 Harvard University Press \$15 BMAGH

Computer Science

- N1) **Fundamental Algorithms** 2nd Ed D. Knuth 1973 Addison-Wesley 634pgs \$20.95 BMASCTH (a must, THE classic)

Assemblers

- C1) **Programming Languages, Information Structures and Machine Organization** P. Wegner 1968 McGraw-Hill 401pgs \$19.50 BMST

Programming

- T1) **Program Style, Design, Efficiency, Debugging, & Testing** D. VanTassel 1974 Prentice-Hall 256pgs \$12 BMAGT
- T2) **Programming Proverbs** H. Ledgard 1975 Hayden 134pgs \$5.65 BMGTH
- T3) **Software Tools** K. Plaugu 1976 Addison-Wesley 338pgs \$8.95 (RATFOR tape \$25) MGT
- T4) **Modu-Learn** T. Barry 1977 Logical Services Inc. 300pgs \$49.95 BMST

Applications Ideas

- X1) **Problems for Computer Solution** S. Rogowski 1975 Educomp Corp. 271pgs \$8.75 BMAEH
- X2) **Computer Clippings** S. Rogowski Creative Publ. 250pgs BMAEH
- X3) **What to Do After you Hit Return** PCC & Hewlett-Packard 158pgs \$6.95 BMGH

Business

- W1) **The Shoestring, Start at Home Computer Business Handbook** 1977 Datasearch Inc. 114pgs \$12 MAHG

Language Manuals

- L1) **Instant Freeze Dried Computer Programming in BASIC** J. Brown 1977 Dymax 159pgs \$6.00 BOH
- L2) **BASIC Software Library** R. Brown 1976 Scientific Research Vol. I 292pgs \$24.95 BMASH, Vol. II 150pgs \$24.95 BMASH

Games

- A1) **Computers, Chess and Long-range Planning** M. M. Botvinnik 1970 Springer Verlag 89pgs \$5.90 MAET
- A2) **Chess and Computers** D. Levy 1976 Computer Science Press 145pgs \$7.95 BGH
- A3) **101 BASIC Computer Games** Digital Equipment Corp. 1975 249pgs \$7.50 BMAEH (checkers, qubic, spacewar, and Hamurabi source code!)
- A4) **Computer Chess** M. Newborn 1975 Academic Press 200pgs \$15 BMAGT
- A5) **Checkers Made Easy** A. Reisman 1959 Key Publ. 124pgs \$1.00 BMETH
- A6) **Let's Play Checkers** K. Grover and T. Wiswell 1972 Tartan Books 188pgs \$1.65 BMETH

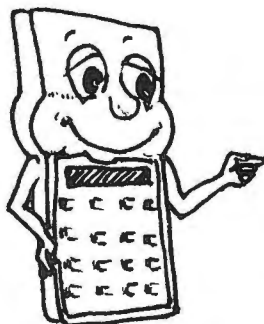
Compilers, Interpreters

- B1) **Compiler Construction for Digital Computers** D. Gries 1971 John Wiley & Sons 493pgs \$19.75 BMET
- B2) **Compiler Techniques** B. Pollack 1972 Auerbach Publ. 558pgs \$19.95 BMET
- B3) **The Design of an Optimizing Compiler** W. Wulff et al. 1975 American Elsevier 165pgs \$8.75 AET

Indexes Etc.

- V1) **The Underground Buying Guide** D. King 1977 PMS Publ. 185pgs \$5.95 BMAGH

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Databooks

- F1) **T.I. TTL Data Book** 2nd Ed.
Texas Instruments 1976 828 pgs
\$4.95 BMAEH
- F2) **SC/MP Microprocessor Application Handbook**, National Semiconductor 1976 162pgs \$5
BMETH

Hardware

- J1) **CMOS Cookbook** D. Lancaster
1977 Howard Sams 414pgs \$9.95
BMGH
- J2) **Diagnosis & Reliable Design of Digital Systems** M. Breuer & A. Friedman 1976 Computer Science Press 308pgs \$18.95
MAET
- J3) **Microcomputer Primer** M. Waite & M. Pardee 1976 Howard Sams 244pgs \$7.95 BMETH
- J4) **Logical Design of Digital Systems** A. Friedman 1975 Computer Science Press 278pgs \$15.95 BMGT
- J5) **Modern Guide to Digital Logic, Processors, Memories & Interfaces** Tab Books \$6.95 BAO (A is for a good section on ECL logic)

Book Review

SC/MP Microprocessor Applications Handbook

National Semiconductor Corp

(see index)

Reviewed by Tiny Matthews

This is the most complete document I have ever read on getting a micro to work. While both the preface and introduction refer you to other publications for detailed hardware and software info, a thorough reading of this one, and a little analysis of the example circuits and programs presented, should enable you to get a SC/MP running.

The approach is mostly cookbook. The utensils (timing, pinout, instruction set) are covered in the first 16 pages, then the recipes take about 100 pages. Specific examples, with devices identified, and excellent source listings, are the order of the day. A/D conversion, cassette inter-

facing and keyboard scanning are examples of the coverage.

If you can read this book without seeing some places SC/MP can relieve your boss processor of some drudgery, you have no heart for hardware at all.

From the hobbyist standpoint, an applications handbook should do two things. First it should help you to convince yourself that the device has applications you can't do without. Second, it should enable you to implement those applications easily. This book does the first part very well, but since my review copy didn't include any hardware I can't verify the second right now. I believe that it will do the job.

A Computer Perspective

Charles and Ray Eames

Reviewed by Larry Press

Charles and Ray Eames, designers of IBM's World Fair exhibits as well as a number of their propaganda/educational films have put together a dense picture book on the history of computing. It starts with Babbage and runs up to 1950. All of the familiar names in the history of computing are there—Babbage, Hollerith, Burroughs, Turing, Eckert, Mauchley, Shannon, Von Neumann, Wiener, the Goldstines, Hopper, etc.; however, the book is unique in the huge number of photographs of these people and their machines and because of the heavy stress on applications. The latter brings in new faces, people who pioneered in computation fields like meteorology, statistics, psychometrics, business, astronomy, operations research, etc. There are, of course, a few surprises even amongst the computer inventors, for example did you know that Konrad Zuse was the first to build a binary adder and the first to represent numbers in floating point form?

The hangup is that the paperback version is out of print so the price is a bit steep: \$15.

History

We've recently seen a number of articles dealing with the history of computers and wanted to mention them briefly. The December, 1976 issue of *Computer Magazine* (5855 Naples Plaza, Suite 301, Long Beach, CA 90803) featured three historical articles. Two dealt mostly with publications and organizations, but the third was "Thoughts on the History of Computing" by J. Presper Eckert, co-developer of the ENIAC. It is full of recollections on the people and technology of the early years of electronic computers. Eckert is still warring with Von Neumann, referring to Von Neumann's "method for taking credit for the work of others."

Also of note is the August, 1976 *Communications of the ACM* (1133 Avenue of the Americas, NY, NY 10036) which reports on the International Research Conference on the History of Computing—an invitation only meeting held last summer at the Los Alamos Labs. The meeting sounded fantastic and featured presentations by many of the pioneering figures in the field. Topics were historical names, historical machines, national perspectives, pre-history and software. It is still undecided how to publish the content of the meeting, but some publication is planned.

Finally, Henry Tropp spoke on the 1940's at the West Coast Computer Faire. Recordings of his and other Faire talks are available at a \$2.00 discount to members from Butterfly Media, 13047 Ventura Blvd., North Hollywood, CA 91604.

ALF Standard Proposal

ALF Product has proposed an interface standard. For a copy send an 8½ x 11, SASE with 24¢ postage to Philip Tubb, ALF Products, 128 So. Taft, Lakewood, CO 80228.

Heath Press Conference

The Heath Company recently invited the editors of all the hobby publications to the unveiling of their systems. I was unable to attend so Phil C. de Baca went in my place. He came back enthusiastic, not just about the computers, but the intangibles as well.

Heath is getting into the field in a refreshingly business-like manner. They have done a lot of technical and market research homework, and have learned much. Their 8080 system is geared toward the hobbyist (estimated market size is 400,000) and they are most interested in *teaching* him about hardware and software. They plan extensive tutorial documentation and see educating the hobbyist as a major goal—I love it.

The LSI-11 system seems to be oriented toward the person with work to do. Here the relationship between Heath and DEC seems of paramount importance. Heath is providing packaging, distribution and support and DEC technical expertise—a symbiotic relationship. Moreover, this is not a one time “group purchase”, but an ongoing partnership with promise of other products in the future. By the way, both systems have the same bus.

Lest they sound too slick and business like, let me assure you that Phil *liked* the folks he met, including company president Dave Nurse, who is a ham, computer enthusiast and a member of ICS (he even has a T-shirt).

Professionals Concerned with Personal Computing

The IEEE held its third annual workshop on microcomputers recently. The workshop brought about 75 rep-

resentatives of academia and industry together to discuss micros. It is notable that the hobby movement was well represented at this professional meeting. Panelists came from such places as *Peoples Computer Company*, *Dr. Dobbs Journal*, *SCCS Interface*, *Byte*, *IMSAI*, and *Dymax* as well as IBM, Intel, Bell Labs, The University of California, etc. We were encouraged by the fact that a professional meeting of this caliber dealt with personal computing and social implications of computers as major topics.

A few random quotes from the meeting were:

- Homes and schools will interact in education.
- Industry should train programmers in hardware, not vice versa (this got a big laugh from the IEEE types).
- Learning the 8080 instruction set does not make you a programmer.
- Computer games are too violent, the ultimate will be a 3-D, holographic, run-down-the-pedestrian game that bleeds.
- The exciting, innovative phase of the development of TV and cars stopped early. That is where we are now.
- We will see many more LSI peripheral chips (color CRTs, disk controllers, I/O ports, etc.).
- We need microprogrammable machines with writeable control stores in order to dynamically alter architecture.
- The Intel development system bus is better than the Altair bus.
- We need a stack oriented machine.
- We need a character oriented machine.
- The designers of the GAMMA language for the 8080 are reluctant to release it because hobbyists drove the developers of 8080 BASIC at Livermore nuts.
- There are 10 billion IC's in the world and 10 million fail each year.
- Programming languages should embody the world view of the problem solver in his problem domain.
- Hobbyists should adapt the IEEE standard 488 General Purpose Interface Bus for peripherals.

Unclassified

Sphere Boards For Sale: CRT/1, CPU/2, 2 Memory (16K, 4K) SIM with dual cassette interface. Contact Richard Likwartz, (307) 362-5316.

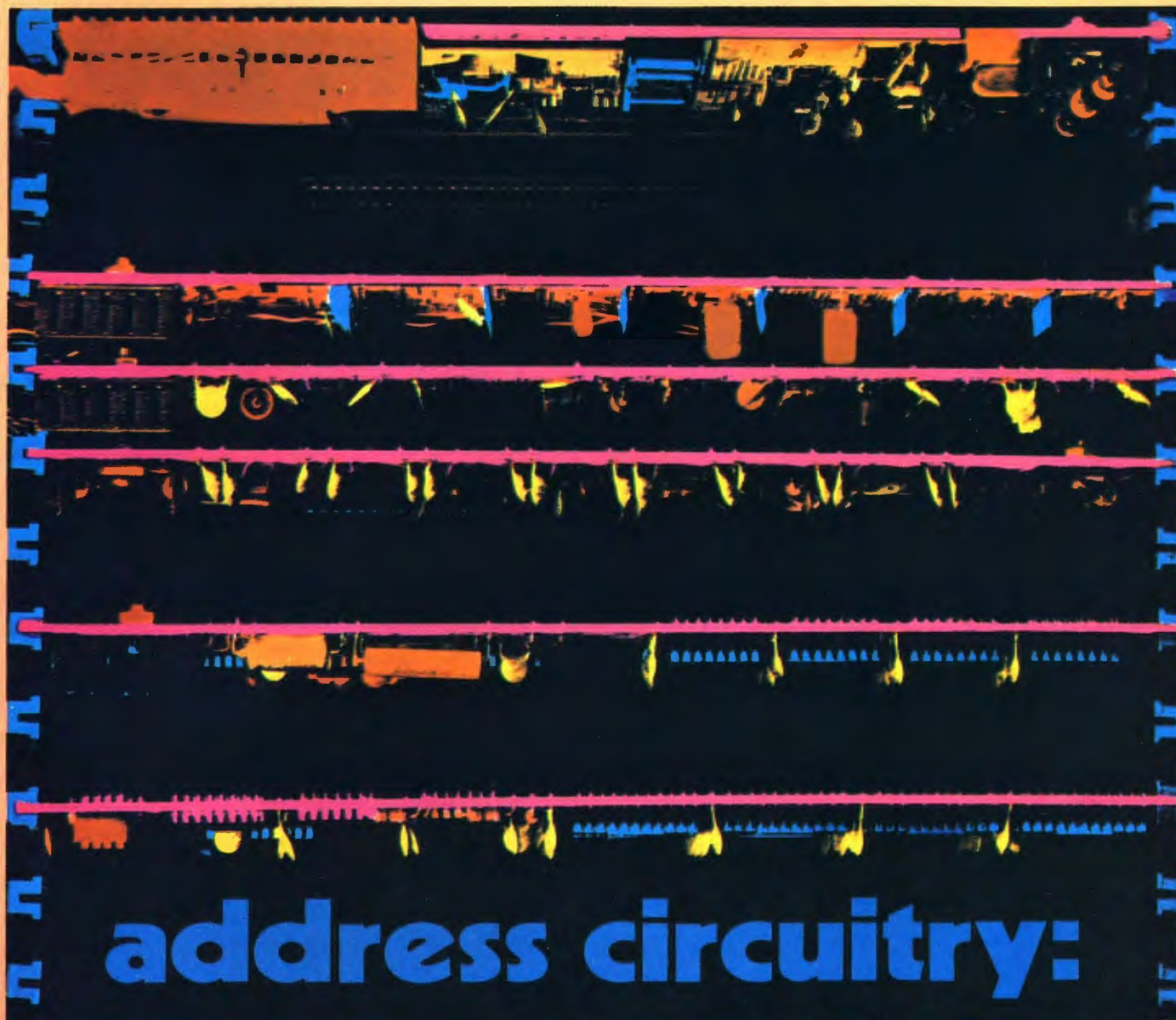
For Sale or Trade: PAIA 2720/R Music Synthesizer. Complete, assembled, tested, near new. \$250 or trade for uP stuff. L. Scheppmann 475A W. San Marcos Blvd., San Marcos, CA 92069 (714) 744-4128.

For Sale: DECwriter II LA 36 one year old \$1200. Brand new PDP 11/03 with addl 4k memory (total 8K) and RS 232C interface. Asking \$2140 (25% below list). Walter D'Ull 2239 Grand Concourse, New York, N.Y. 10453 (212) 933-0300.

ALTAIR 8800B system for sale: 8 installed connectors/guides plus MITS 2SIO plus Two Pro. Tech. 8KRA memory boards (16K) plus doc. plus shipping: New, over \$2060. This system just as good \$1780. Has been working without fault for 6 months. Also have working TV DAZZLER for sale separately. Scott Plunkett, 1025 Kaimoku Place, Honolulu, HI 96821 (808) 373-9137.

FOR SALE: “Computer Monopoly” written in data general 12K BASIC. Runs in 22K core—all game rules are implemented. Computer acts as banker and bookkeeper. Can be played with two to eight players. Listing \$6.00. Paper tape \$12.00. Charles A. Lovell, 4837 Clybourn Ave., North Hollywood, CA 91601.

FOR SALE: Reconditioned ASR33 Teletype, \$725 or offer. CIPHER 9 Track/800 BPI Tape Drive, \$350. MITS VLCT, assembled, no case, \$50. PROCESSOR TECHNOLOGY 3P+S I/O Board, assembled and working, \$150. ICOM IC-230 2M XCVR, \$395. NOVATION Acoustic Coupler, \$45. PLESSEY 2Kx8 Core Memory w/Drivers and Read Amps, \$20. Will swap for ? (303) 667-5238. James R. Einolf, 3900 Fox Drive, Loveland, CO 80537.



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Unlike today's microcomputers, our Mini 12 is fully software supported by an advanced operating system, including...file handling text editor, symbolic assembler,

loaders, ODT (octal debugging technique), batch processor, and system utilities.

The MINI 12 comes with 8K of memory and is easily expandable to 32K. Because the MINI 12 processes 12 bit words (instead of 8 bit bytes) you need far less memory. For most applications... using our optional MINI STORE digital cassette system with the BASIC compiler, you will never need add another single byte!

Because we want you to have the pleasure of using your minicomputer right away, our MINI 12 comes fully assembled, debugged and ready to plug in. It includes a full front panel, controller for eight digital tape drives, and built-in serial interface plus other technical niceties like a binary loader and monitor bootstrap in ROM memory.

Frankly, when compared with microcomputers, we're surprised at how good a deal we are. Write... or better yet, give us a call @303-794-1634 and let us help you get it all together!

TLF Post Office Box 2298, Littleton, Colorado 80161, Telephone 303-794-1634